MODERN Machine Shop

HOWARD CAMPBELL, Editor

Volume 6 FEBRUARY, 1934 Number 9

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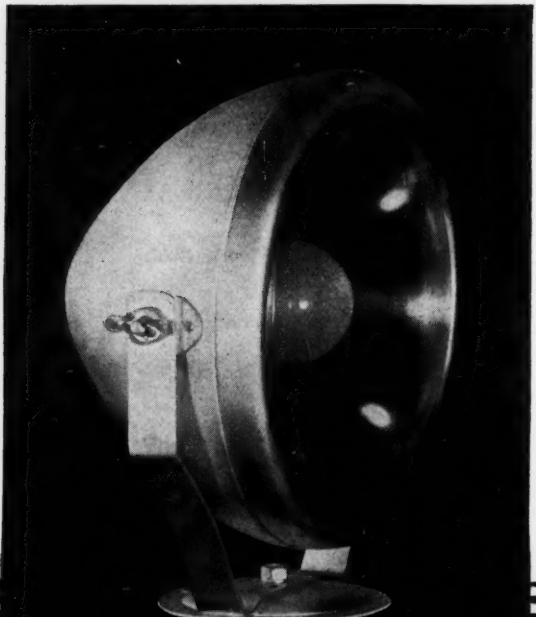

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MODERN Machine Shop

CINCINNATI, OHIO VOL. 6, NO. 9

FEBRUARY, 1934

# How Wood Boring Bits Are Made

BY AVERY E. GRANVILLE

THERE is no tool in more common use than is the twisted steel bit employed for boring holes in wood. Carpenters could no more do without them than they could do without saws. Women, boys, and men in every walk of life use wood bits frequently. Yet very few of us have any real idea as to how these bits are made; how the twist is produced or how the funny little lead-screw on the end is made. Any novice who has ever tried to sharpen a dull wood bit has soon come to the conclusion that it took an expert workman to produce such a tool in the first place, and that both a good eye and a good hand are needed to do even a passable sharpening job.

This article comprises a brief outline of the factory process of making wood boring bits as it is carried out in one of the larger wood tool manufacturing plants. This shop makes all kinds of bits for wood working, some to be used in the familiar hand brace and others for use in various types of wood working machines. The manufacturing process is the same for all kinds of bits, in a general way, differing only in a few details such as the forming of the ends of the shanks—square for hand braces and round for machine use.

The steel stock from which the bits are made comes in the form of round bands which are cut to length as shown at a, Fig. 1. The next operation consists in heating each section, in turn, and forging the shank as shown

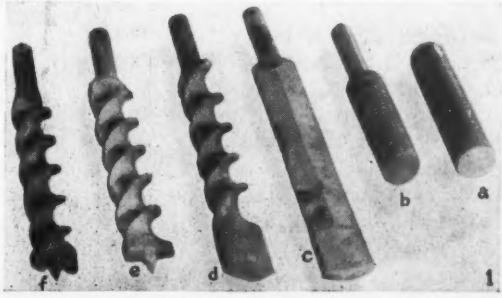
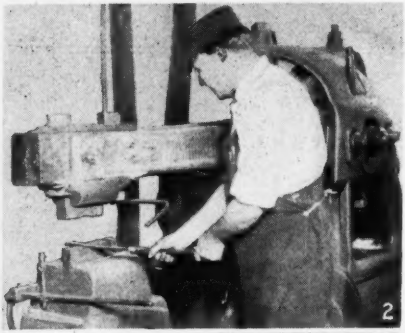



Fig. 1—Finished and semi-finished pieces showing the several steps in the making of a wood boring bit.

at b. After this has been done the piece is again heated and the part that is to be twisted to form the bit proper is drawn out in convex form as shown at c.

The forging of the shank to the shape indicated as b is done between forming dies in a helve hammer, shown in Fig. 2. The speed at which a skilled workman will turn out forged bit blanks is surprising.



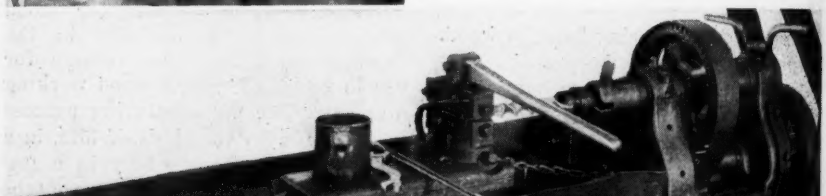
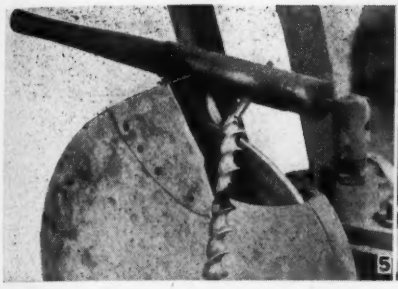


Fig. 2—An experienced workman and a Bradley hammer can turn out a surprisingly large number of tools in a day. Fig. 3—By heating the bit to a bright red heat and then twisting it in this machine, the necessary spiral is obtained. Fig. 4—To make sure that the spiral is accurate, the tool is reheated and "rectified" by means of a pair of these dies.

Putting the twist in the forged blank is the next operation, for which the machine shown in Fig. 3 is used. The shank is held in the clamping device shown in a central position on the bed of the machine, and the flattened end is inserted between the jaws of a slotted "chuck" on the spindle nose. A weight, attached to the carriage by means of a chain, provides tension to keep the carriage to the left, and a foot treadle provides means for moving the carriage to the right when a piece is in position to be inserted in the chuck.

With the forged blank heated red hot and in place in the machine as shown, the operator throws in a clutch which applies the power. The spindle revolves slowly, twisting the steel roughly as indicated. As the twist is slowly formed, the operator watches it closely and if it seems to be twisting faster at any given point than throughout the rest of the piece, he drops a little cold water on that spot. The cold water hardens the steel slightly and slows the twisting process; thus he is able to control the



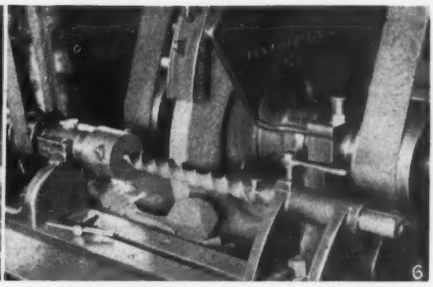


Fig. 5—This friction disc is used to remove excess metal from the lips and cutting edges. Fig. 6—Grinding the bit to the specified diameter.

twist and keep it approximately even. The work is gaged by the eye alone. When it is twisted sufficiently, the operator releases the foot treadle, allowing the weight to pull the carriage back and thus withdraw the bit from the slot in the chuck. It is then released from the clamp.

As the twist just described is only approximately correct, it is necessary to rectify it by the use of the dies illustrated in Fig. 4. These dies are made in pairs, and six pairs of various sizes, for different sizes of bits, are shown in the illustration. The dies are used in special presses in which one section of the die is held stationary while the other section is moved to and from the first section rapidly. After the rough-twisted bit has been reheated to the proper temperature, it is held with a pair of tongs and fed between the dies by hand. This operation corrects whatever inaccuracy the rough twisting left. The result of the two operations just described is shown at d, Fig. 1.

The small "tit" on the end, in which a thread is cut so that it will act as a lead-screw, is formed by the use of a punch and die in a punch press, the result being as shown at e, Fig. 1. The end of the blank at each side of the tit is next upset to provide the necessary metal for the cutting lips. The upsetting operation leaves considerably more metal just back of the lips than is needed, and the surplus is

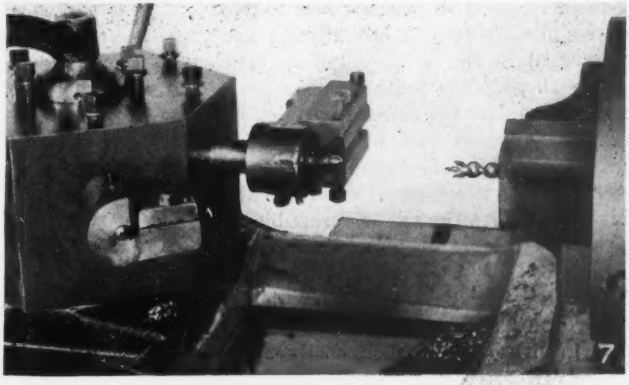


Fig. 7—Here the bit is shown chucked in a turret lathe, ready for the tit and cutting edges to be shaped by means of turret tools.

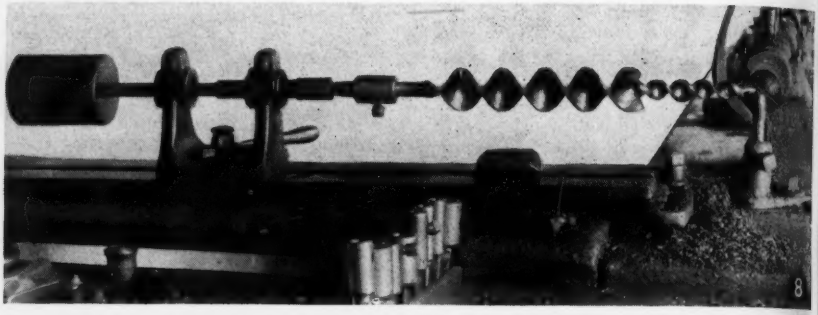


Fig. 8—Screw threads are formed on the tit by pressing the blank against the grooved surface of this disc while the disc is revolved at high speed.

removed by holding the bit against a steel disc friction wheel, shown in Fig. 5. This steel disc runs at a high rate of speed and removes the superfluous metal faster than it can be done with a grinder.

The bit is now chucked in a grinding machine, as shown in Fig. 6, and is ground to size diametrically. In the next operation it is chucked in a turret lathe, as shown in Fig. 7, and the tit and the cutting edges are shaped.

The most interesting operation of all is the last one—the forming of the screw threads on the tit so that it will act as a lead screw. This operation is performed as shown in Fig. 8. The tool shown in process is a double or counterboring bit, but all bits are processed in the same manner. The screw threads are neither cut, milled, nor turned, but are formed by friction, using a friction tool with concentric grooves or rings machined in the face.

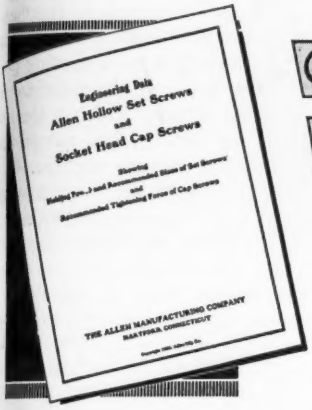
As the friction tool revolves, the bit is held with the tit, or screw blank, pressed against the grooved disc, where it is slowly revolved by hand. The friction causes the screw blank to become red hot, in which condition the grooves in the disc easily form corresponding grooves in the blank.

However, in order to form a screw, the thread must have a "lead", thus the screw must be fed longitudinally at the same time it is being revolved. To impart lead to the screw, the shank of the bit is held in a spindle which is threaded at the left end to fit a corresponding thread in a nut that is held in the left hand bracket. By revolving the spindle, the bit is moved forward or back according to the lead of the thread on the spindle. On the

Fig. 9—Another view of the forming tool, or disc, showing the alternate V-grooves and concentric threads.

(Continued on page 26)

# Draftsmen and Engineers!

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# Machine Shop Keeps Movies Moving

THE machine shop, otherwise known as the "mechanical laboratory", is the busiest spot on a moving picture lot. It is possible to stage a play without the aid of machinery, but not so the modern moving picture.

Not only are the moving picture cameras, projection machines, and other apparatus that is used in picture taking and making manufactured by the use of precision tools and machines in the most modern of plants, but a well-equipped machine shop forms an essential part of the equipment of each producing laboratory and is depended upon to keep the photographing, projecting, and recording equipment operating at its highest efficiency.

If repairs to equipment

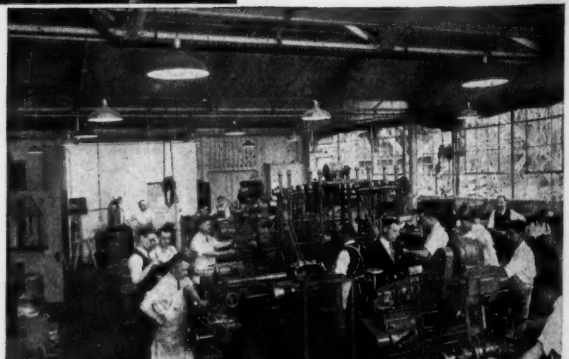

**Fig. 1—Camera and microphone boom in use during the filming of "Cavalcade". The boom carries the camera, the camera man, his assistant, and the director, and will raise them twenty feet in the air or through an arc of 360 degrees over the "set". Fig. 2—View of the interior of the machine shop on the Paramount lot. Two shifts, working eight hours each, are necessary in order to keep up with the maintenance and development work.**

Fig. 3—Another view in the Paramount machine shop. The building is of steel and concrete saw-tooth roof construction, affording a maximum of light.

are necessary; if a new camera of special and intricate design is needed; if a "dolly" or "boom" is required, the machine shop is looked to to iron out the troubles or produce the necessary equipment. None but the best of machines and tools are used and none but the best of mechanics are employed for this work.

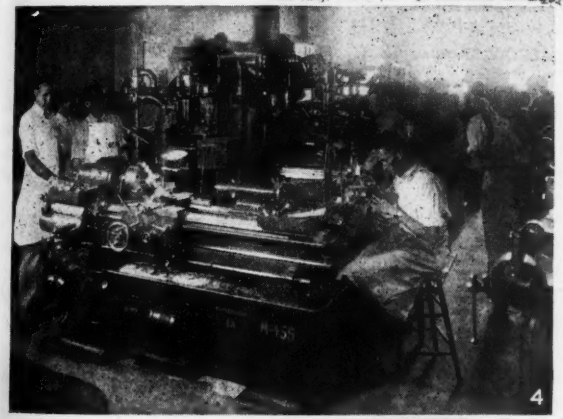

Fig. 4—A special section of the Paramount mechanical laboratories, in which only printing and developing machines and equipment are repaired.

The machine shop on the Paramount lot is a modern, well-lighted, saw-tooth roof building, located centrally in the 26 acres of administration buildings, studios, carpenter shops, dress-making and wardrobe shops, photographic developing and projection rooms, and other divisions.

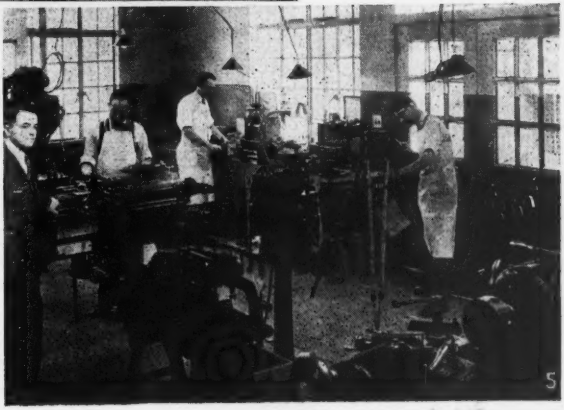

Fig. 5—A corner in the machine shop at the Fox Movietone studio. These men are not only highly skilled mechanics; they must also have a thorough knowledge of photographing and recording processes.

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# Production Planning in the Small Shop

**(Conclusion)**

*In this, the concluding section of this article, the author takes up the question of tooling, and when and to what extent it is justifiable.*

By Myron A. Lee

**Professor of Industrial Engineering, Cornell University**

THE question of tooling for the manufacture of a part too often receives entirely inadequate consideration.

In the first place it is absolutely necessary that the Tool Design and Tool Making Departments work in close cooperation and coordination with the Planning Department. The tooling to be used must be determined in order that a satisfactory Operation Sheet may be prepared for a part. Of even greater importance the tools **must** be manufactured **on schedule** that they may be available at the proper time to meet the production schedule for the part. This is easy enough to say and its logic is irrefutable but any production man will agree that it is frequently very difficult to accomplish.

**What Tooling is Justifiable?**

In determining the tooling for a part the first consideration is probably interchangeability. The requirements as to interchangeability for the part should be ascertained and the minimum of tooling which will meet these requirements determined. Obviously this minimum requirement must be met. Any tooling beyond this minimum should be capable of economic justification before it is approved.

In considering the question of economic justification, certain assumptions and even approximations must be made. First, how should the cost of tooling be estimated?

**(a) Labor Cost**

The estimated labor cost can be arrived at by any facilities available at the plant in question. The tool manufacturing foreman should be able to make a reasonably accurate estimate of the labor required to manufacture the tool, if no more exact method is available.

**(b) Expense**

Since the tool manufacturing department is an expense department, the usual cost keeping method is to allocate the tool room expense in some manner to the producing departments. However, for purposes of comparing tool costs, a machine expense item should be included in the cost of the tool. If expense in the production departments is distributed by the machine rate or machine hour method a logical hourly rate can be set by these same principles for each machine in the tool room. Then for each esti-

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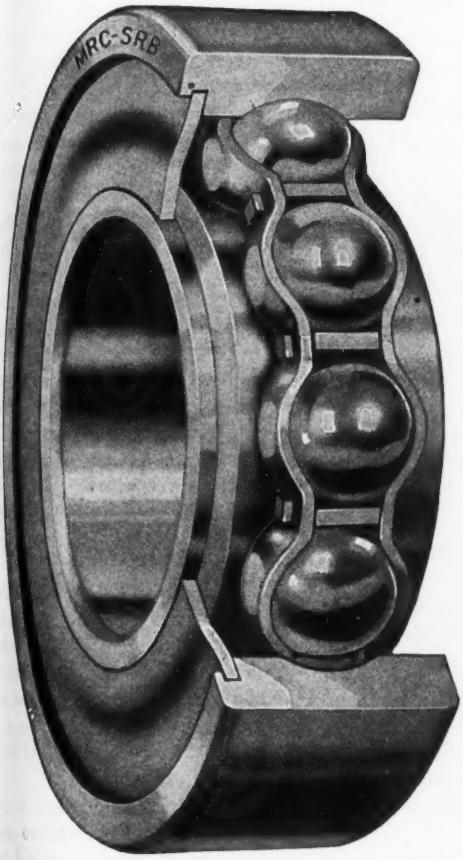


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mated labor hour for the production of the tool the appropriate machine charge can be added.

**(c) Time to be Considered**

In making comparisons it will be necessary to estimate as accurately as possible the probable life or use of the tool. This estimate would, of course, have to be made by each concern in accordance with its own conditions, but once made it should form a valid basis for the determination of comparisons.

Because of the variety of problems occurring in any plant, it would seem impossible to devise formulae comparable to those for the determination of economic lot size which would be applicable to tooling. However, it should be possible to decide economically between several possible tools or fixtures in any given case. To illustrate a suggested solution, a simple case will be assumed.

A part is to be machined in an ordinary vertical milling machine. There are 25 of these parts per lot and it is expected that approximately three lots per year will be produced.

Three methods of operation are to be investigated:

1. Using no fixture; part to be positioned on milling machine table with blocks and clamps.

2. Using a single fixture to hold part on table.

3. Using two fixtures so that the part in one fixture may be changed while the part in the other fixture is being milled.

Referring to Table I, the items of cost for the fixtures are assumed as follows:

Item 1. Pattern cost assumed to be $15.00.

Item 2. Cost of casting assumed as $2.00 for one fixture and $4.00 for two fixtures.

Item 3. Screws for fixtures, assumed as costing 40c for one fixture and 80c for two.

Item 4. Cost of machining fixtures. It is estimated that it will take 2 hrs. to mill one fixture, or 3 hrs. to mill two fixtures. At 80c per hr. this would result in a milling labor cost of $1.60 for one fixture and $2.40 for two.

Item 5. Assuming that the expense charge for the milling machine used for milling the fixture is $2.00 per hr., the expense for one fixture would be 2 hrs. at $2.00 or $4.00, and 3 hrs. at $2.00 or $6.00 for methods 2 and 3 respectively.

Item 6. Estimating the time for drilling and tapping as 1 hr. for one fixture and 2 hrs. for two fixtures, the labor costs for this operation at 60c per hour would be 60c for one fixture and $1.20 for two fixtures.

Item 7. The expense charge for the drilling and tapping machine to be used is assumed as $1.00 per hour resulting in a charge of $1.00 for one fixture and $2.00 for two.

Item 9. Obviously there is a certain amount of fixed expense attached to keeping fixtures in a plant, such as charges for storage space, expense of tool room attendants, interest on investment, etc. This charge is assumed to be 12 per cent of the cost of the fixture per year.

Item 10. If it is assumed that three lots of parts will be processed per year, one third of Item 9 would be chargeable to each lot.

**Cost of Operation per Lot by the Three Methods Suggested**

The estimated costs by the three

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methods are tabulated in Table II.

Item 1. Set-up time has been estimated as slightly greater where blocks and clamps are used than when using a fixture; i. e. 30 minutes for Method 1 and 20 minutes for either Method 2 or 3.

Item 2. Set-up time has been assumed to include locating the first piece on the milling machine table.

**TABLE I**
**Cost of Fixtures**

| Item | Method 1. No Fixture | Method 2. One Fixture | Method 3. Two Fixtures |
|---|---|---|---|
| 1 Pattern | | $15.00 | $15.00 |
| 2 Casting | | 2.00 | 4.00 |
| 3 Screws | | .40 | .80 |
| 4 Milling—Labor | | 1.60 | 2.40 |
| 5 Milling—Machine Expense | | 4.00 | 6.00 |
| 6 Drilling and Tapping—Labor | | .60 | 1.20 |
| 7 Drilling and Tapping Machine Expense | | 1.00 | 2.00 |
| 8 Total Cost of Fixtures | $0.00 | $24.60 | $31.40 |
| 9 Fixed charge on fixtures per year at 12% | $ 0.00 | $2.95 | $3.77 |
| 10 Fixed charge on fixtures per lot, assuming 3 lots per year | $0.00 | $0.98 | $1.26 |

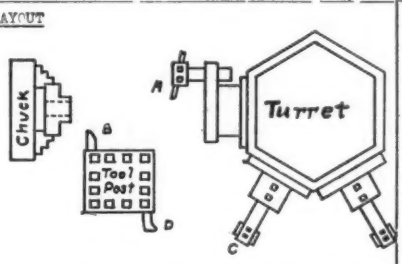
**TABLE II.**
**COST OF OPERATION PER LOT OF 25 PIECES**

| Item | Method 1. No Fixture | Method 2. No Fixture | Method 3. Two Fixtures |
|---|---|---|---|
| | Time per lot Minutes | Time per lot Minutes | Time per lot Minutes |
| 1 Setup time | 30 | 20 | 20 |
| 2 Change time | 288 | 48 | 12 |
| 3 Machining time | 375 | 375 | 375 |
| 4 Total time | 693 | 443 | 407 |
| | Cost per lot Dollars | Cost per lot Dollars | Cost per lot Dollars |
| 5 Labor at 75c per hour | $8.66 | $5.53 | $5.09 |
| 6 Mach. Expense at $2.00 per hr. | 23.10 | 14.77 | 13.57 |
| 7 Total | 31.76 | 20.30 | 18.66 |
| 8 Fixed charge on Fixtures | 0.00 | .98 | 1.26 |
| 9 Grand Total | $31.76 | $21.28 | $19.92 |

## STANDARD INSTRUCTION SHEET

Customer .....
Part Name SPUR GEAR - with hub. Part No. .....
Operation Name Bore & rough hub. Op. No. 10 BO
Dept. 11 Mach. Class 54 Mach. Name Warner & Swasey #2A
Made by D. V. Approved by D. V. Date 1-19-25 Mat'l SAE 2315

| No. | Operations | Tools—digs, &c. | Speed Setting | Speed Ft. Min. | Feed Setting | Feed In. Rev. | Base Time |
|---|---|---|---|---|---|---|---|
| | TOOL LAYOUT | | | | | | |
| | SETUP TIME | | | | | | 90. |
| | PROCEDURE | | | | | | |
| 1- | Chuck piece | | | | | | .10 |
| 2- | Start mach. & adv. tool carriage | | | | | | .14 |
| 3- | Advance turret | | | | | | .05 |
| 4- | Set tool to stop & throw in feed. | | | | | | .20 |
| 5- | ROUGH HUB | A- 3/4" Spec. tool | 60 | 132 | 0078 | | M |
| | ROUGH HUB | B- 1"St. Nose tool | 30 | 132 | 0078 | | |
| 6- | Back turret & index. | | | | | | .09 |
| 7- | Back & index tool carriage. | | | | | | .13 |
| 8- | Chg. speed & feed & adv. tool carriage. | | | | | | .28 |
| 9- | Adv. turret & throw in feed. | | | | | | .12 |
| 10- | ROUGH BORE | C- Kelly Cutter | 45 | 93 | .011 | | M |
| | ROUGH FACE | D- 5/8"x1¼" Tool | 150 | 66 | .015 | | |
| 11- | Back turret & index. | | | | | | .09 |
| 12- | Chg. feed, adv. turret and throw in feed. | | | | | | .15 |
| 13- | FINISH BORE | E-Kelly Cutter | 45 | 93 | .011 | | M |
| | ROUGH O.D. | B- 1" Tool | 150 | 66 | .015 | | |
| 14- | Back turret & index | | | | | | .09 |
| 15- | CHAMFER BORE | | 50 | | Hand | | .20 |
| 16- | Back Tool carriage & stop mach. | | | | | | .08 |
| 17- | Remove piece | | | | | | .06 |
| | Total Handling Time for Piece | | | | | | 1.78 |




**Standard Instruction Sheet, with which is combined an Operation Sheet. Only the handling times are shown. For any given part the machining times are computed from the feed and speed and the dimensions of the part.**

With a lot consisting of twenty-five pieces, change time would therefore be allowed for 24 pieces. This time is estimated as 12 minutes without fixtures, 2 minutes using one fixture and 30 seconds using two fixtures. The change time per lot would then be 24 x 12 = 288 min. for 1st method;

24 x 2 = 48 min. for 2nd method;
24 x ½ = 12 min. for 3rd method.

Item 3. Machining time is estimated as 15 min. per piece for any method, or 25 x 15 = 375 min. for a lot of 25 pieces.

Item 5. Labor payment has been estimated at .75c per hour in each case. In the first method the labor cost would be $\frac{693}{60}$ x .75 = $8.66

Item 6. The expense (or overhead) charge for the milling machine to be used is $2.00 per hour. For the first method this would amount to

$$\frac{693}{660} \times 2.00 = \$23.10$$

Item 8. The fixed charge on fixture per lot (Item 10, Table I) is added in the total cost for methods 2 and 3. Fixed charge on blocks and clamps used in method 1 would be practically nothing and is assumed as zero.

**Interpretation of Results**

By method 2, the saving over method 1 would be $31.76-$21.28 = $10.48 per lot or 3x10.48 = $31.44 per year. On this basis the fixtures would pay for itself in $\frac{24.60}{31.44} \times 12 = 9 +$ months.

Such an expenditure would undoubtedly be considered as amply justifiable.

By method 3 the saving over method 2 is 21.28—19.92=$1.36 per lot or 3x1.36=$4.08 per yr. The added cost of fixture for method 3 over method 2 is 31.40—24.60=$6.80. Fixture would pay for this added cost in $\frac{6.80}{4.08} \times 12 = 20$ months.

This would probably be considered as justified and method 3 approved.

The above illustration is given merely to suggest a method of solution for any problem where it is desired to determine which of several methods is better from an economic point of view. The method is simple and straightforward and establishes a sound basis for procedure. This is much better than to depend on off-hand judgment, which is quite apt to be in error no matter how experienced the person making the decision may be.

# Some Pointers on the Care of Ball and Roller Bearings

By Wm. C. Betz

THE use of balls and rollers in bearings comprises a scientific method of eliminating friction which can be duplicated by no other means. Such bearings require no great amount of care, but such care as is required in the use and maintenance of these bearings must be of an intelligent nature. A knowledge of some of the innumerable causes for failure of ball and roller bearings will undoubtedly help to eliminate the possibility of trouble with bearings while they are in service.

The first requisite for long service is to select a bearing of the proper size and type for the work in hand. The selection must necessarily be based upon the size of the shaft and the amount of load that will be carried.

The second point to be taken into consideration is the matter of lubrication. A bearing that is to be run at

high speeds should be lubricated with light oil, and only a small amount should be used, as excess lubricant in as anti-friction bearing tends to heat rapidly due to the churning action of the rolling elements in the grease.

Grease can be used in slow-moving bearings if it contains no foreign matter. Grease should be free from graphite, lamp black, mica, flower of sulphur, chalk, or any other substance that might segregate and load in the races. All oils and greases must be free from acid, as acid will quickly destroy the fine finish of the ball and race surfaces.

To test a lubricating oil for acid, a piece of clean cloth should be saturated with the lubricant and wrapped around a brightly polished piece of cold rolled steel, where it should be left for approximately ten days. If the shaft shows stains upon removal of the cloth, the lubricant is unfit for use in anti-friction bearings. If the shaft has remained bright, the lubricant is satisfactory.

Greases containing any solid ingredients which can separate from the oils are unfit for use in anti-friction bearings; the solids are liable to pack in the raceways to such an extent that the cages will be broken and the bearing ruined.

In mounting anti-friction bearings, extreme care should be exercised to prevent dirt from getting into the bearings or mountings. Dirt, in one form or another, is one of the most frequent causes of bearing failure.

Driving a bearing onto its shaft by striking the outer ring is a sure way to ruin it, as by so doing the balls are driven into the races, leaving minute indentations which are the fore-runners of "spalling."

Forcing the inner ring onto its shaft when the shaft is too large, making a tight drive fit, is also detrimental to a ball bearing and this also applies to the fitting of the outer ring into its housing. A few tenths of a thousandth of an inch drive—probably equal to a good push fit—backed up with a lock nut or ring, is sufficient to hold any inner ring in place. The outer ring is best left a light push fit in its housing, in most installations.

On long, straight drives where there are a number of bearings in line, care should be taken to make sure that the shaft is lined up accurately, otherwise undue strain is loaded onto the bearings and excessive wear will result. Tight belts, chains and gearing are direct causes of bearing failure, as are also poor foundations and housings, and bent shafts. A poor retaining device that may break and get caught between the races and balls is another source of potential trouble.

Over-loading will cause spalling of the races and balls, and the same trouble is caused by excessive side thrust. Ball bearings should not be used where there is an excessive pounding action, and roller bearings only on advice of bearing engineers.

Excessive heat or prolonged heating above 350 deg. F. will ruin a bearing in a short time. When it is desirable to use ball bearings under high temperature conditions, it is well to consult a bearing engineer. For service in excessively cold places, it is necessary to use a lubricant that will not congeal. De-waxed oils give the best results in such cases.

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# Welding Speeds Building of Golden Gate Bridge

By C. B. Leahy

**Supervisor, Applied Engineering Department, San Francisco District, Air Reduction Sales Company**

THE Golden Gate Bridge, now in process of construction, crosses the entrance to San Francisco Bay and thus connects the city of San Francisco with Oakland and the other cities on the North side of the bay. The building of the bridge, as with any other large bridge, involves a considerable amount of under-water caisson work, in which a large number of air receivers are used. The fabrication of the heads for the air receivers has until recently been a slow and rather expensive operation, the heads being hot pressed from ½-in. material and finished by machining in the lathe.

The machining operation consisted of cutting the skirt from the head and then beveling it. The writer conceived the idea of utilizing an old, discarded lathe of ample swing capacity for holding and revolving the heads, and cutting the skirts from the heads with an acetylene cutting torch. A picture of the lathe is shown in Fig. 1, set up with a head in the chuck, the cutting torch, and holding head. The holding head was practically the same as a "bull-center", as it served the purpose of centering the work-piece and holding it in position. It was rotatably mounted on the tail-stock spindle so that it could revolve freely while the head was being trimmed with the torch.

In order to slow the machine down to the proper speed for torch-cutting, a structure was built up over the headstock to hold

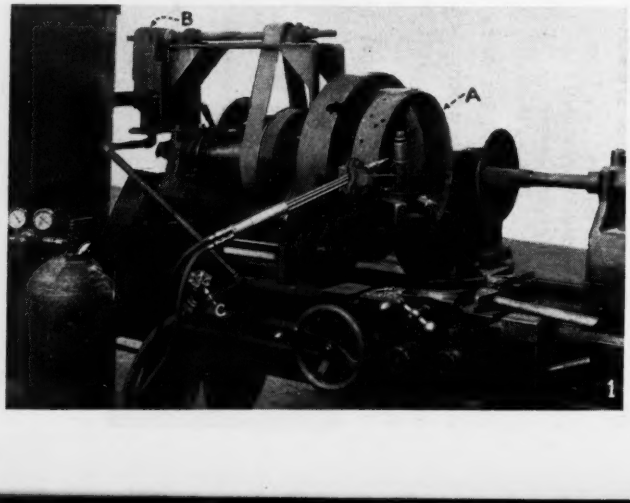


**Fig. 1—Lathe equipped for trimming and beveling air receiver heads by the use of the acetylene cutting torch. An air motor B revolves the work-piece at a speed of 2 ft. per min.**

Fig. 2—Lathe shown with head in place for trimming.

a shaft and its bearings, and an air motor was connected to the end of the shaft. The air motor is indicated at B in Fig. 1, the chuck at A, and the valve controlling the air supply to the motor, at C.

The fireworks display shown as Fig. 3 is a reproduction of the cutting operation in process. The heads, which are 18 in. in diameter, are revolved at a peripheral speed of 24 in. per minute. A Style 24, No. 2 Airco tip was found to give the most satisfactory results, with an oxygen pressure of 32 lbs. and acetylene pressure of 3 lbs. With this equip-

Fig. 3 — The torch-cutting operation in process.

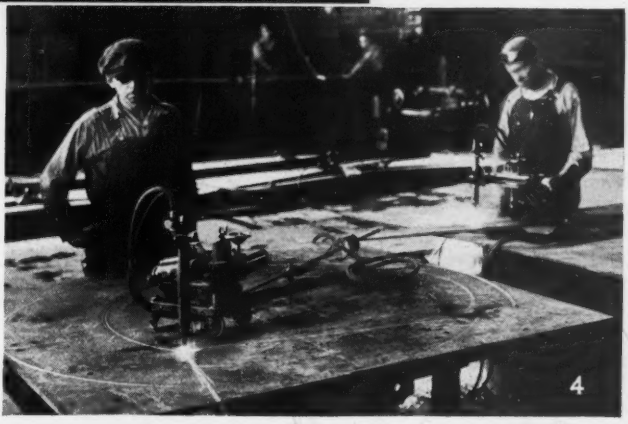

Fig. 4 — Using the Radiagraph to cut elliptical shapes for diving bells.

ment 15 heads per hour is the usual output, whereas, by the previous method of cutting by machine, one head per hour was considered good production.

Figure 4 shows the cutting of elliptical shapes in heavy sheet metal by the use of the Radiagraph. The Radiagraph holds the torch at any desired height from the work and will cut circular sections accurately. By adjusting the radius rod on the Radiagraph shown in operation in the illlustration, oval or elliptical sections up to 30 ft. in diameter can be cut quickly. The equipment as used here is cutting elliptical shapes that are required for the diving bells that are used in bridge construction.

## Making Wood Bits

*(Continued from Page 10)*

tail end of the spindle is a wooden cylinder upon which the operator rests his forearm while working on this operation, and as he presses the screw blank against the friction disc, he rolls the cylinder with his arm and thus moves the bit forward or backward. Only a few passes are necessary to complete a screw.

An enlarged view of the friction tool is shown in Fig. 9. Following the forming of the lead screw, the flutes are polished, the lips and cutting edges are filed, and the bit is ready for the novice to dull or break on a nail in some old board, or for an expert mechanic to lay away carefully in his kit for many years of good service.

**OPTICAL GEAR TESTER.** Catalog 563 of Societe Genevoise d'Instruments de Physique, The R. Y. Ferner Co., 1133 Investment Bldg., Washington, D. C., American representatives, describes an apparatus for rapid tests of spur and helical gears between 0.16 and 4 inches in diameter of 50 to 10 diametral pitch. Readings of pitch and eccentricity to 0.0001 inch are made from the projection of a rectangular shadow on a glass screen. Suitable adjustments provide for quickly changing the set-up from one gear to another. The optical tester is entirely enclosed in a dust tight case.

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# IDEAS FROM READERS

This department is a clearing house for ideas . . . If there is a "kink" or short cut in use in your shop, send in a description of it . . . Each one published will be paid for.

## Automatic Turret Lock

By Geo. L. Pyritz and Edward E. Huffman

NOW, as never before, it is imperative that manufacturers take into account every item, however small, which will tend to reduce manufacturing costs. All manufacturers cannot buy new equipment, yet they must compete with those using the most modern machines. They must, among other things, incorporate improvements in their old machines to meet competition. It is possible, for instance, to equip an old turret lathe with an automatic lock at small cost, to replace the old style hand-operated turret lock. The writers have designed and installed automatic turret locks on a number of machines. This improvement alone permits some increase in production and conserves the energy of the operator.

The design here shown was applied to a much-used make of turret lathe. It was necessary to replace the center stud of the turret with the one as shown at **A**, Fig. 1. This stud was made of low carbon steel, case hardened and ground. A binder nut **B** was operated by a gear sector **C** at the bottom of the turret carriage. Both the gear sector and the binder nut were secured to the shaft **D** by serrations, the gear sector being also held by a pin. These parts were made of a tough alloy steel and hardened. The nut **E** was used to adjust the tapered bearing **F** of the center stud, in the turret, so that the turret would turn freely, but without shake. A cap **G** covered the binder nut and prevented it from being tampered with after it had been adjusted to the proper binding pressure.

A ball thrust bearing **I** was placed between the binder nut **B** and washer **J**, which reduced to a minimum the friction required to properly bind the turret. Into the lower part of the turret carriage a hole was drilled for the reception of a hardened gear locking pin **H**, Fig. 2, which was backed by a spring **O** and held in by a screw **P**. The gear cover **K** was made of thin gage sheet metal. The release pin **L** was of case-hardened steel. The rack **M** and release plate **N** were made of case-hardened steel and secured in the bed of the turret slide by screws and dowel pins.

The operation of the turret lock is as follows: Start with the turret carriage forward, or in the working position. The turret is moved back, or to the right, until the tools clear the work. As this movement is continued the release pin **L**, Fig. 2, travels up the incline on the release plate **N** and pushes the gear locking pin **H** completely out of the gear sector **C**. The gear sector then comes in contact with the rack and turns in the direction of the arrow marked **T**. This motion is transmitted through the shaft **D**, Fig. 1, to the binder nut **B**, which releases the binding pressure on the turret. It will be noted that

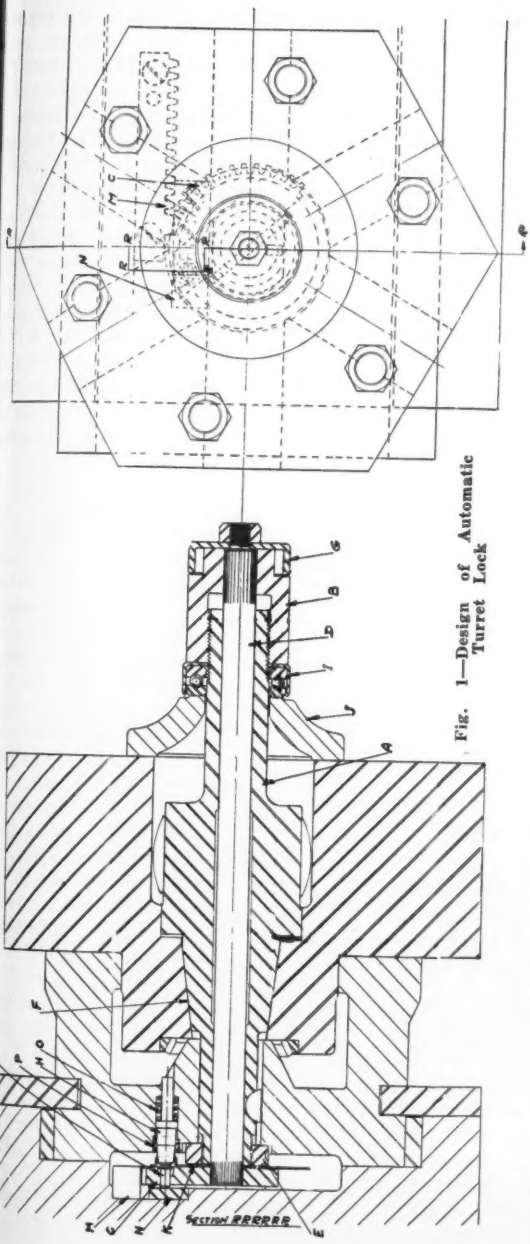

Fig. 1—Design of Automatic Turret Lock

the first tooth of the rack is very wide, and there is a corresponding wide space in the gear sector. This tooth was made wide to withstand the sudden shock of contact when the gear sector meshed with the rack. This shock, which is severe because of the overcoming of the binding pressure, is very slightly felt in the turnstile. No additional effort of the operator is required to pass this point in either direction, that is to lock or unlock the turret.

It will be further noted that the face of the wide tooth is cut at an angle of about 5 deg. This was necessary for the following reason: When the turret was moved forward or to the left into the locked up position and the gear sector came out of mesh with the rack, there was a very slight reverse movement of the gear sector, due to the releasing of the torsional strain on the shaft D. When the turret was moved back (to the right) into the unlocked and indexing position, the corner of the wide tooth on the rack would hit the face of the first tooth on the gear sector and prevent meshing, were it

not for the angle on the wide tooth face. This allowed the first tooth of the gear sector to slide over the wide tooth of the rack into the proper meshing position.

The back movement of the turret carriage is continued until the turret is indexed, the gear sector meanwhile rolling on the rack. When the forward movement starts, the binding nut is turned in the opposite direction (see arrow marked **U.**) As this movement continues, the gear sector runs off the rack and the turret is locked. The gear locking pin is then directly over the hole in the gear sector. With further forward movement of the turret carriage, the release pin travels down the incline on the release plate and allows the gear locking pin to be forced by the spring **R** into the hole in the gear sector.

To adjust the binding pressure the turret carriage is run forward until the gear sector clears the end of the turret slide bed. The nut and cap **G** are removed, and the shaft **D** with the gear sector **C** is dropped until the end of the shaft clears the serrated hole in the nut. The binding nut **B** is then adjusted to the pressure desired. In replacing the shaft in the binder nut, it is necessary that the gear locking pin **H** enter the hole in the gear sector, to insure proper meshing of gear sector and rack. A fine adjustment is obtainable because of the number of serrations on the shaft, there being thirty-six.

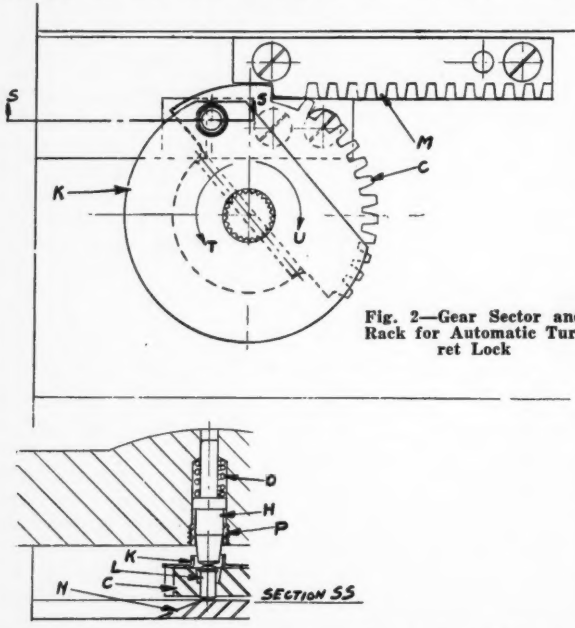


**Fig. 2—Gear Sector and Rack for Automatic Turret Lock**

The gear locking pin was necessary to insure the meshing of gear sector and rack under any condition. Sometimes an operator, in the hurry of production, indexes the turret so rapidly that the tool to be used is rotated past center before the indexing pin comes into position. He then attempts to bring the tool back into position after the turret is locked up by pulling on a tool or bar in the turret, as one would pull on a wrench handle. If the turret is thus rotated, which is sometimes possible with great effort, the gear sector would be rotated so that it could not mesh with the rack, were it not for the gear locking pin.

The gear cover **K** rested upon the gear sector, but did not rotate with it. Its purpose was to prevent the release pin **L** from jumping out of the gear sector, which might otherwise be caused by shock of contact of the turret with the index stop.

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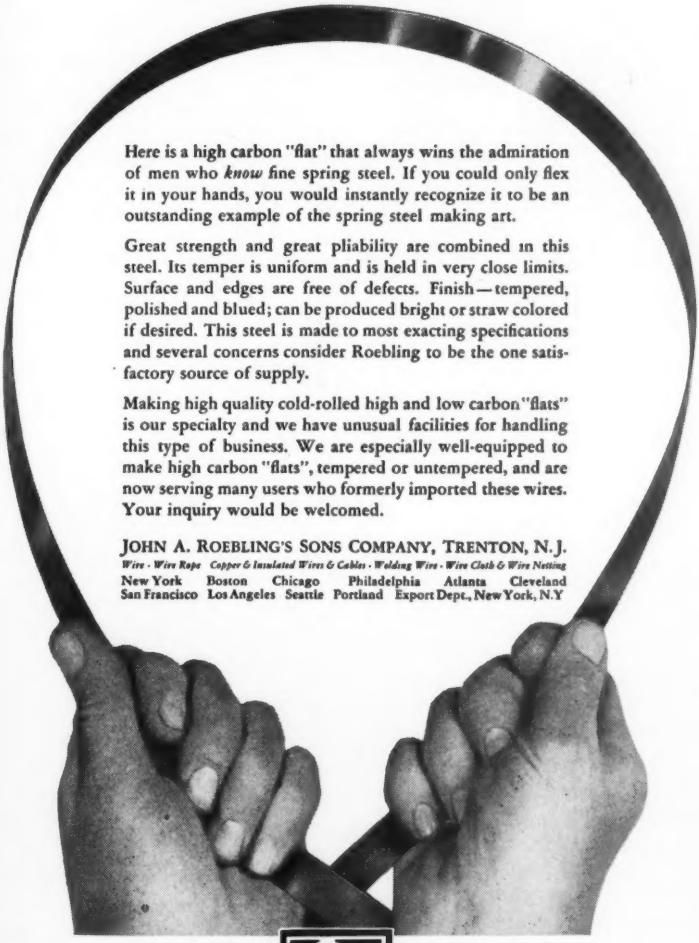

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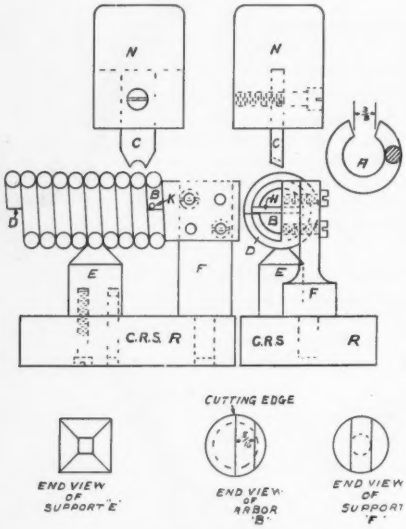
## Die for Cutting Rings from a Coil

By Charles Kugler

HAVING need for a number of 1¼-in. brass rings, we made the rings by winding a length of brass wire into a coil like a coil spring and then cutting off the rings by the use of the die shown in the illustration.




**Die for Cutting Rings From a Coil**

Each ring had a ⅜-in. gap, as shown at **A.**

We made a round arbor, in the periphery of which a groove was cut to conform to the inner helix of the spring, as illustrated at **B.** One end of the arbor was machined on both sides, leaving a flat section **H** slightly thinner than the gap in the ring, so that the ring could be slipped off over the end of the arbor after it had been severed from the coil. Holes were drilled in the flat section and the arbor was dowelled and screwed to the support **F.** The lower end of the support **F** was turned to a press fit for a hole in the base **R,** and the support **E** was anchored in the base by dowelling and screwing as shown.

The rings were severed by the punch **C,** which was held in the holder **N.** The cutting edge was grooved to conform to the radius of the wire. In production, the operator screws the coiled wire onto the arbor until the end of the wire strikes the stop-pin **H,** at which point a gap of ⅜ in. is left between the end of the wire and the cutting edge of the punch. He then trips the press and a ring is cut off, which the operator removes by slipping it over the thin section at the end of the arbor.

It can be seen that a full ring could not be cut with this arrangement as the support **F,** which must be strong enough to hold the arbor, would interfere with the removal of the ring. However, it would be possible to make a hinged support that could be swung out of the way whenever the end of the arbor was full of rings, or a support could be made with a plunger which would slip into a hole in the end of the arbor. When the plunger was withdrawn, an opening could be left wide enough to allow the rings to be slipped off the arbor.

---

## Leveling and Aligning Shafting

By W. F. Schaphorst

THE well-known fact that water (or any other liquid) will always find its own level can sometimes be turned to account. For instance, a length of hose full of water may be used to find the relative levels of the ends of a shaft, or of any other two sur-

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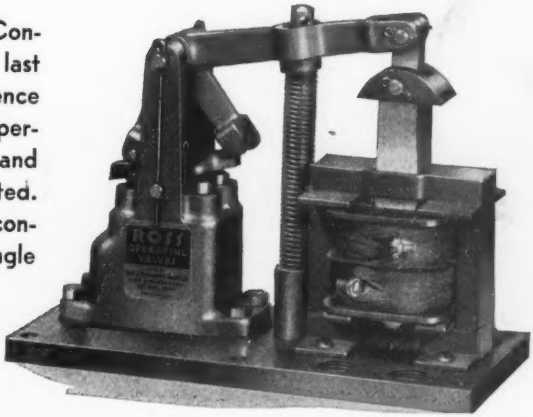

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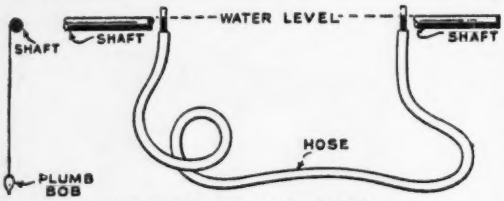
faces, even when these levels can be determined by no other means.

The hose should be long enough to reach some distance if it is to be used in aligning shafting, and, of course, should not leak. A gauge glass is




**Using Hose To Align Shafting**

slipped into each end of the hose and the hose is filled with water. In filling, the receiving end should be held slightly higher than the other end, so that all air will be forced out of the hose. When the hose is full, one end is held so that the gauge glass crosses the upper surface of the shaft at one point and the opposite end is held likewise at another point, preferably as far away as the hose will permit. Regardless of how high or how low the ends of the hose are held, the surface of the water in the two glasses will be level. Consequently, if the shaft is perfectly level, the water in both glasses can be brought to the level of the upper surface of the shaft at the same time. If one end of the shaft is higher than the other, when the water is at the level of the shaft in one glass the variation can accurately be determined and measured in the other one.

It is important to remember that the hose should not be filled by immersing in a tub of water, due to the fact that air may be imprisoned and thus interfere with the accuracy of the gauging. Nor should water be used of varying temperature; that is, it should not be warm at one end of the hose and cold at the other.

To determine whether or not the shaft is straight, suspend several plumb bobs from the shaft, as shown in the drawing, all from the same side of the shaft. It is then possible to sight along the line of cords and see whether any of the cords are out of line. If they are not in perfect alignment, the shaft is not straight and should be straightened before further use. A better method of checking the alignment of the cords is to stretch a cord horizontally close to the line of plumb bob cords. If one of the bob cords is out of line the misalignment of the shaft can be measured.

## Trimming a Drawn Job in the Lathe

By Brent Cassell

SOME years ago while working in a small job shop in a Minnesota town, I was given the job of finding

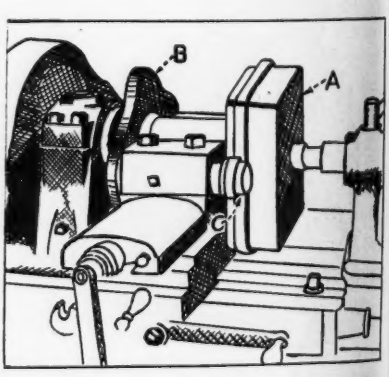



**Fig. 1—Trimming a Drawn Job in the Lathe**

a way to trim some sheet steel box covers. We were not over-burdened with equipment, consequently I had to

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"Moly" took 20 seconds; regular heavy duty blade, twice as long."

# SAYS WHO?

WHO says he can't reduce hack saw costs in his shop? The man who hasn't used "Moly" blades!

Who says they *have* done all the things illustrated on this page—and more? The users of "Moly" blades—the men who know.

There are a dozen ways that "Moly" saves. It is lower in first cost than other blades used for heavy duty service. It cuts better, cuts faster, lasts longer on any kind of work, and does the difficult cutting jobs that would be a practical impossibility with ordinary blades. "Moly" blades are not only keen cutters—they are tough enough for your worst conditions.

Discriminating purchasers in the metal industry have standardized on "Moly" blades for both power and hand hack saws. They are new in performance, new in appearance and new in price.

**CLEMSON BROS., INC.** **"MOLY"**

MIDDLETOWN, N. Y.

Write us about your most difficult or expensive hand or power hack saw jobs, give us the name of your supply house and we will see that a type of "Moly" blade is recommended that will give you 50 to 100% more production for every dollar expended for blades.

GENUINE "MOLY" BLADES ARE MADE ONLY

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plan on doing the job with the tools at hand and finally decided to do it in a lathe. The drawings show the design and application of the tools and method of doing the job.

Figure 1 shows one of the covers, A, in place on the fixture which was threaded onto the spindle nose of the machine. The fixture was a casting, with a four-lobed cam on the spindle end and a square section on the end toward the tailstock, the square section being machined to fit

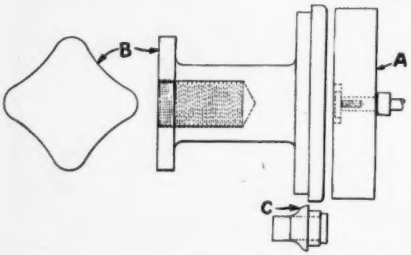


**Fig. 2—Drawing Showing Design of Trimming Tools**

the box cover. Clearance was allowed for the edge of the cutter C, as shown in Fig. 2. The cutter, which was of high speed steel, had a rotary cutting edge on one side and a section on the other that acted as a cam roller and kept the cutting edge in the proper relation to the work. The cutter was held by a stud with a large head, the stud being screwed into the side of a block on the compound rest, as shown. A cam roller was attached to the rear end of the base of the compound rest, at the left side, where it made contact with the cam B. A stub arbor in the tailstock spindle was forced against the block A to hold the work in place while the operation was in process. The nut was released from the cross-feed screw so that the tool could be operated freely.

In operation, the compound rest was fed in until the cutter C was in contact with the work, then the spindle was revolved and the work was trimmed by the cutter. The cam action of the cutter on the work moved the toolslide in one direction and the cam B, with its roller, moved it in the other. The relation of the cam B to the fixture was such that the high points on the cam alternated with the corners of the work-piece and thus kept the cutter against the work.

## An Unusual Application of Trigonometry in Die Work

By C. W. Hinman

THE problem outlined here was one which the writer encountered while engaged in the designing of dies for the production of truck wheels in the Russian "Autostroy" plant. It was so unusual, and the solution was so interesting, that I recorded it for future reference and, incidentally, for the benefit of other designers who are interested in problems of this kind.

The irregular line GC in Fig. 1 represents half the sectional contour inside a drawn steel core for an automobile truck wheel, which was also the contour for the sectional face of the drawing punch. The given dimensions were reduced to those shown in the diagram. It was necessary to make a jig-boring layout for a female templet to fit the contour of the punch, during which several other unknown dimensions appeared. Since all the horizontal jig-boring dimensions were given from the center line C, our first task was to compute the length of the line BC, and therein lay the problem.

To work, draw the indefinite per-

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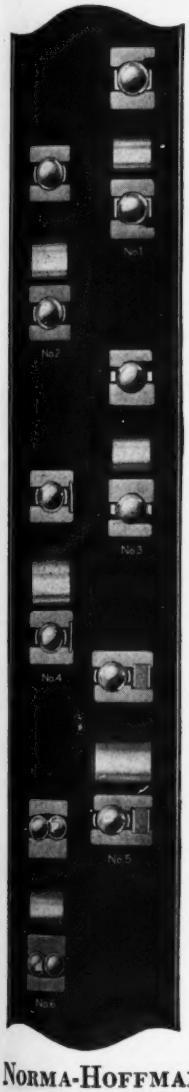

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THIS is the objective of every executive, engineer and designer; and the performance of the bearings in a production machine is a vital factor in keeping costs down. * * * * But, in comparing bearings, look beyond first cost—look to the ultimate cost over a period of years. Let proved performance point the way to your decision. * * * * For over 20 years, in every field of industry, Norma-Hoffmann **PRECISION** Bearings have been making distinguished records for unfailing dependability—records which command the confidence of those who seek the lower production costs that come with the use of better bearings.

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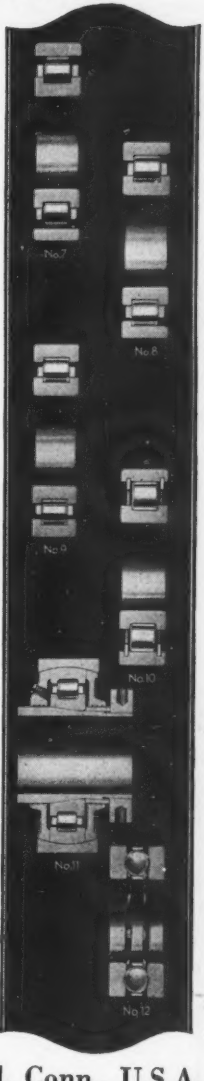
6—Double-row, self-aligning ball bearing; also furnished with adapter sleeve and nut.
7—Standard cylindrical roller bearing.
8—One-lipped cylindrical roller bearing.
9—Two-lipped cylindrical roller bearing.
10—Full type (retaining ring) cylindrical roller bearing.
11—Self-aligning adapter type cylindrical roller bearing with grease-retaining, dust-and-moisture-excluding side plates.
12—Ball thrust bearing.



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pendicular line OB from the radial center O. Draw line AB parallel with line DC, and intersecting the perpendicular line OB at B. Then the length of the line BC is 10.750 in., minus the length of the line AB. It is obvious that the length of the line BO is the difference between 3.586 in. and the sum of 15/16 in., plus the hypothenuse AF in right triangle AFH, or 1.635 inches.

Figure 2 shows the problem isolated. Two right triangles having an unknown common hypothenuse AC, and whose combined angles at A are 42 deg. 15 min. with short sides given as 1.000 in. and 1.635 in. respectively, to find angles J and K and solve the length of the line AB.

$$\text{By proportion } \frac{\text{Sin. K}}{1} = \frac{\text{Sin. (42 deg. 15 min.—K}}{1.635}$$

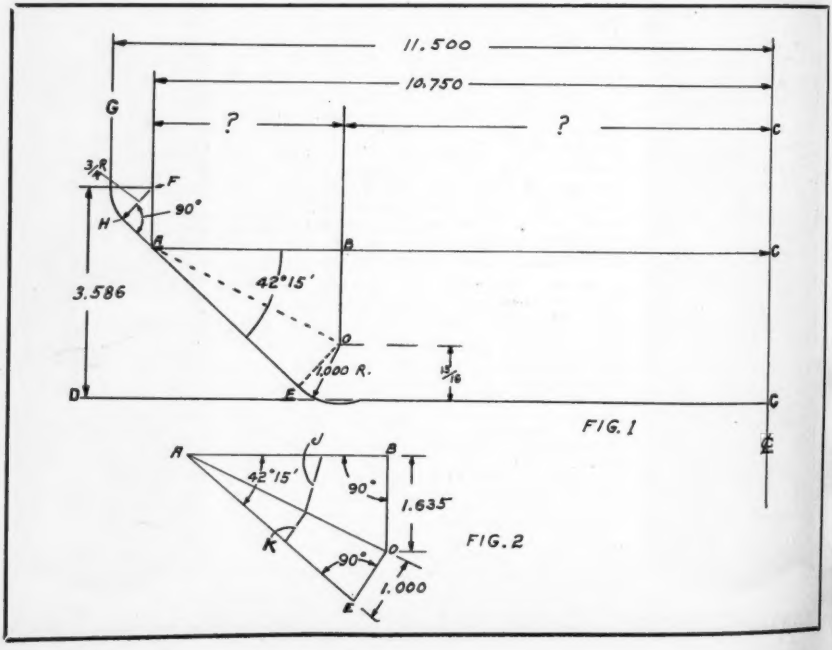
By the trigonometrical formula for the Sin. of the difference of two angles, we have

$$\text{Sin. K} = \frac{\text{Sin. 42 deg. 15 min. Cos. K—Cos. 42 deg. 15 min.}}{1.635}$$

$$\text{Transposing: } \frac{\text{Sin. K}}{\text{Cos. K}} = \text{Tan. K.} = \frac{\text{Sin. 42 deg. 15 min.}}{1.635 + \text{Cos. 42 deg. 15 min.}}$$

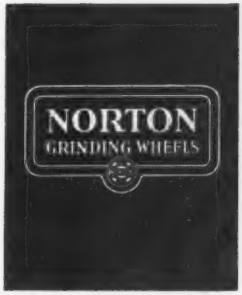
Angle K = 15 deg. 48 min. 20 sec.
Angle J = 26 deg. 26 min. 40 sec.

Length of line AB = 3.287 in. and BC = 7.463 inches.



# r That
# ylindrical Grinding Job

IF your cylindrical grinding jobs are like the majority —are high production, high precision operations— you know that their success depends on very exact fitting of the wheels, they must be right in every particular. It's not enough to consider just abrasive and bond, grain and grade. Wheel structure, too, must be right. And with Norton Wheels you can get just the required structure (grain spacing)—for Norton controls the structure by definite, graduated steps. No matter what your cylindrical grinding job may be you can get a Norton Wheel that will do it right.

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# Over the Editor's Desk

## Progress

ANNOUNCEMENTS of new tools and machines and other equipment for the machine shop are coming in so fast, these days, that we are put to it to keep track of them and get them into shape for publication as fast as they arrive.

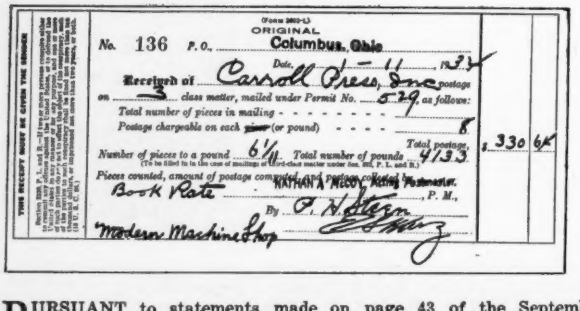
Now that production schedules are being stepped up and the market for tools and equipment is expanding, the number of time-saving and labor-saving tools that are being announced is constantly increasing—and each new tool or machine that is presented to the trade offers a potential saving in time or labor or an increase in the quality of the product. Watch the New Shop Equipment Section of this magazine each month; it may mean dollars to you.

## "Man and Metals"

YOUR editor has just been reading the book by the above title and, in view of the increasing importance of metals in our daily lives, takes this opportunity to bring this volume to the attention of those who are inclined toward research and study. The author is T. A. Rickard, who is a consulting engineer to the U. S. Bureau of Mines. It appears that Dr Rickard was led to write this book because his friend and fellow-student, H. G. Wells, seemed to slight the parts that have been played by mining and metallurgy in the development of civilization when he wrote his famous "Outline of History."

The first chapters of Dr. Rickard's book are given over to a brief account of the history of civilization, followed by a lengthier treatment of the ages in which metals probably played no parts. However, the greater part of the book is devoted to the discovery and use of the various metals and the manner in which the use of metals accelerated the growth of civilization.

Today our vehicles, our furniture, and even some of our houses are made of metals of one kind or another. Even the commercial system of our modern civilization is based upon the standardized value of one of these metals. These facts as outlined in this volume have a special appeal to the person whose life-work is based upon his knowledge of the working of metals.



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Modern Machine Shop

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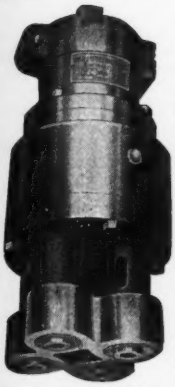
PURSUANT to statements made on page 43 of the September, 1933 issue of MODERN MACHINE SHOP, the United States Post Office receipt showing the number of copies of the January issue of this magazine that were placed in the mails is reproduced above.

# More Holes per Minute



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Yet Oil Dermatitis can be prevented. One pint of Derma-San added to fifty gallons of cutting oil ends all danger of oil infection. It can be used freely, for it does not irritate the hands, never causes rusting, never turns rancid, and never clogs the feed pipes.

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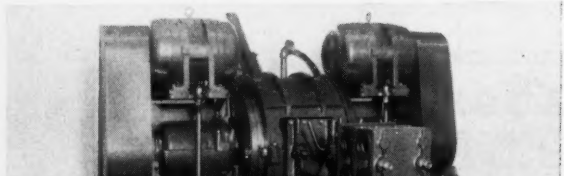
# NEW SHOP EQUIPMENT

## No. 84—30 In. Gardner Grinder For Coil Springs

The latest major development in motor car manufacture—the new type of independent spring suspension used on the front end of many of the 1934 models—has attracted general interest. This radical departure from the accepted construction, displayed at the recent automobile shows, marks the first breaking away from the semi-elliptic spring suspension which has been standard for so many years.

The large coil springs now used by many manufacturers must be ground on both ends to insure parallelism and a flat seat over 75 per cent of the area of each end. It is furthermore required that the ground ends be held within one-half degree for squareness with the axle.



**No. 84—30-in. Gardner Grinder set up to grind a representative coil spring, 12½ in. long, 5¾ in. O. D., and ⅞ in. diameter wire. Production is 150 per hour. Stock removal averages 3/32 in. per end and the springs are held to within 1/32 in. for parallelism and uniformity and within ½ deg. for squareness with the axis.**

The large double spindle Gardner Grinder illustrated here is one of several machines that have been built by the Gardner Machine Company, Beloit, Wis., for the leading automobile plants. The machine is equipped with large diameter grinding wheels—usually 26-in. or 30-in., and is provided with a hydraulically-operated oscillating knee upon which is mounted an indexing type of fixture as shown in the illustration. Each end of the fixture carries a number of the springs; either two or four depending on the size and production requirements, and while one end is oscillating between the grinding members, the operator unloads and reloads the other end.

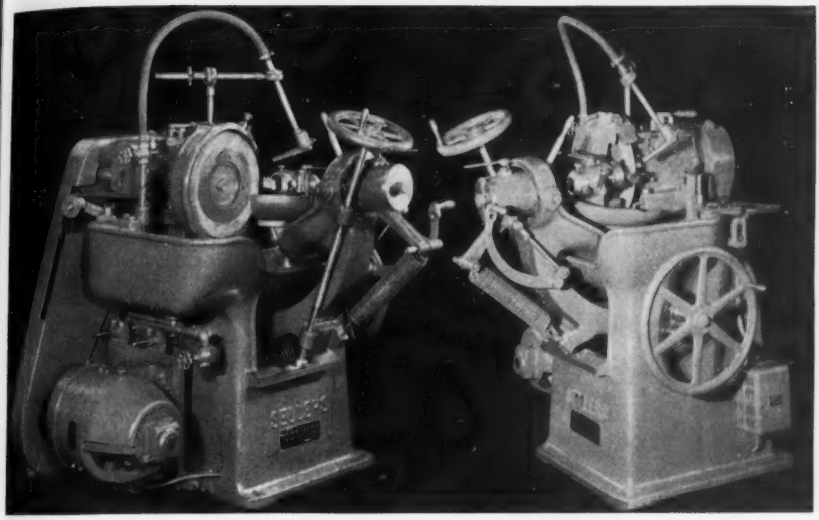
During the oscillation of the work the two grinding wheels gradually close in upon it until the springs are ground to a predetermined length. This in-feed of the heads is not a continuous travel; rather, the heads are caused to close in a few thousandths of an inch with each oscillation of the work. Operation of the oscillating knee is fully automatic, and the entire grinding process is thus practically continuous.

## Sellers No. 2A Tool Grinder

Standard or special tool shapes can be ground to the exact angles of clearance or rake desired; flat, straight surfaces can be produced, and the tools can be ground in a minimum of time by the use of the Sellers No. 2A Tool Grinder, shown in the illustration. In addition the accuracy desired can be obtained without difficulty by an unskilled operator.

The machine is designed to operate on the principle of "line contact", which is accomplished by oscillating the tool up and down in a vertical plane tangent to the periphery of the grinding wheel. Thus the tool surface is in contact with the grinding wheel only at the high point of the periphery of the wheel, permitting high unit pressure with fast, free cutting.

By setting the tool at the angle desired and then reciprocating it vertically



**Left and right side views of Sellers No. 2A Tool Grinder**

past the contact point, the contacting surface is ground flat and the correct angle is maintained to the cutting edge. Furthermore, an abundant flow of coolant can be applied at the point of contact, thus absorbing the heat as fast as it is generated and accelerating the grinding action. A full universal chuck is used, which permits any face of the tool to be presented to the wheel at any angle.

The machine can be used to grind any cemented carbide or high speed steel, straight or convex curved face tools, including thread tools of any angle or pitch, internal or external, and will accurately reproduce any angle or clearance. The holder will accommodate tools with shanks up to 1½x2 inches. Scale graduations, reading to 1 deg., are located to permit the operator to set the tool quickly and accurately for the angle desired.

The machine is driven by a 3 h. p. constant-speed motor, a.c. or d.c., about 1150 r.p.m., the motor connecting by V-belt with provision for tightening the belt whenever necessary. The grinding wheel is of the usual shape, 15 in. in diameter, the cylindrical surface only being used for grinding. The wheel is carried on a spindle which runs in heavy ball bearings of the pre-loaded type, positively eliminating lost motion. The customer may select a wheel for grinding carbides or high speed steel, as he desires.

The spindle has an axial reciprocating motion which can be started or stopped instantly. Moving the wheel back and forth across the face of the tool, however, insures smooth work and keeps the wheel surface true. The feed screw, actuating the in-and-out movement of the tool holder, is designed to eliminate back lash by maintaining positive contact between the screw and nut.

A built-in centrifugal pump forces water to the tool through a large-diameter hose and adjustable nozzle, furnishing a large volume of coolant at low velocity. Lubrication of the spindle and other important parts is effected by a high pressure grease gun system.

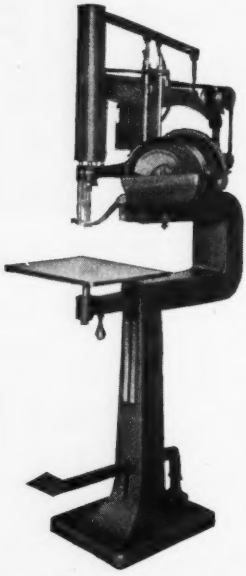
Standard equipment includes a wheel, coolant system, chuck, auxiliary chucks for curved face tools either bent or straight. Also one for circular tools and one for setting circular filleting tools, a cam for grinding curved face tools, gage for setting curved face tools, wheel-truing tool, all wrenches, and high pressure grease gun. Tables and diagrams giving cutting and clearance angles for all ordinary tools are also included.

The net weight of the machine, with motor, is about 2,770 lb.; gross, 3,500 lb. Floor space required, 4 ft. 8 in. x 4 ft.

6 in. Overall height, 5 ft. 8 in. The machine is furnished for motor drive only. The finish is Sellers standard machine tool gray.

## Detroit "Universal" Magazine Feed Power Screwdriver

The illustration shows the Universal Magazine Feed Power Screwdriver with 18 in. and 24 in. throat clearance, which has been placed on the market by the Detroit Power Screwdriver Co., 5367



**Detroit "Universal" Magazine Feed Power Screwdriver**

Rohns Ave., Detroit, Mich. The Model B-2 machine illustrated here, although primarily adapted for driving machine screws, will also drive wood screws, cap screws, or self-tapping screws with either standard or special heads and from the No. 4 machine screw to the ¼ in. size, and from ¼-in. to 1¼-in. long.

To prepare for operation, a quantity of the screws are placed in the hopper. The "pick-up" which is similar in form and action to the palm of the hand, dips into the hopper at each revolution, lifts a small quantity of the screws, and works them into position for delivery by means of the chute. There is no interference from undelivered screws, screws having screw slot burrs, or eccentric or imperfect heads. The spindle-friction mechanism so functions that the lower spindle, carrying the driver, is under power only during the instant of driving the screw. The bit, rotating by drift only as it seeks the slot of the screw and perfectly muted as it leaves the slot after the screw is driven, cannot mar the head of any screw regardless of the speed at which the spindle is operated.

The thrust and turning tension are separated into two distinct and independent elements. The tension at which the screws may be set is under precise control; this tension control is entirely independent of the always varying pressures applied at the pedal, and not perceptibly affected by momentum. Momentum as it concerns tension control is confined within the light, hollow, lower spindle. There is no damage to threads, which is a desirable feature when light work, such as thin brass stampings, is being assembled.

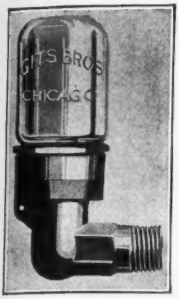
The holding fingers, which are a part of the spindle assembly, carry the screw down through the full stroke—maximum stroke 4¼ in.—and release their hold on the screw, usually, after a thread or two have engaged. As a result, the machine will drive screws not only on a flat surface, but also behind a ledge, in a deep channel, or in the bottom of a tube or cup as small as 1 in. in diameter. Thus the machine will drive screws continuously in places that are inaccessible to the fingers.

The machine shown is made with either 18-in. or 24-in. throat clearance, thus making it adaptable for use in the manufacture of large parts such as automobile doors or large assemblies of stampings. This desirable feature has been obtained by locating the return spring in the upper column and providing for operation of the spindle through chain and sprockets around the yoke to the foot lever.

## Improvement in Design of "High Speed" Riveting Hammer

The High Speed Hammer Co. Inc., Rochester, N. Y., manufacturers of the Rotary Type Flexible Blow Riveting Hammer, has announced a number of improvements in the design of this machine. The new features are so designed that they may be applied to existing machines, making unnecessary

## Gits CONSTANT LEVEL Oilers




**Maintain correct oil level.**

**Prevent burning out of motors and bearings.**

**Capacity ⅝ to 32 ozs.**

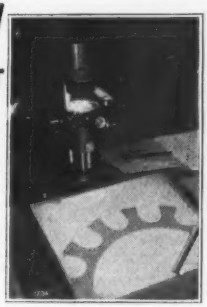
**Can be furnished in either hinged or removable bottle types.**

*Send for catalogue.*

**GITS BROS. MFG. CO.**

**1847 S. Kilbourn Ave. Chicago, Ill.**

## The NEW Desk Type Projector



provides an easy and exact means of inspecting the form and accuracy of many metal parts.

Magnifications of 10, 20, 50 and 100X exact to 1/2000th.

No shadows of operator's head, hands and implements.

Measurements made with glass scales.

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**THE R. Y. FERNER COMPANY**

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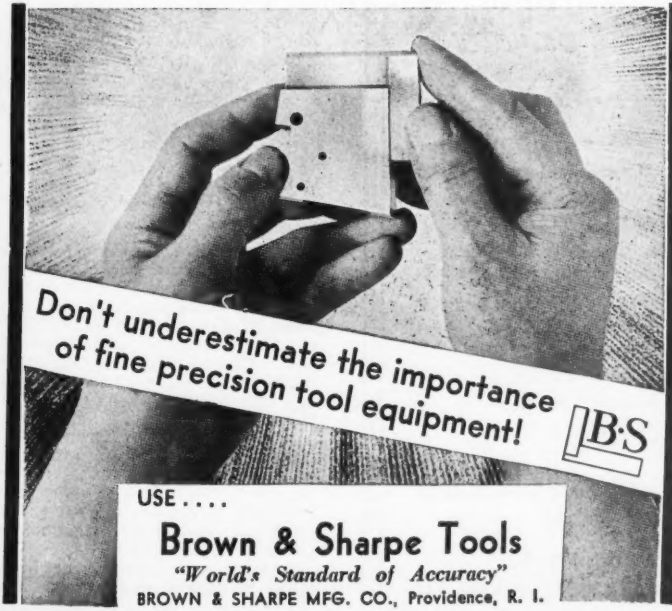
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# BLANCHARD Sectored Wheels

increase the efficiency of your No. 16 Blanchard Surface Grinders. They combine the advantages of segment and solid cylinder wheels. The V shaped notches give clearance for chips to escape and for water to reach the work, while the continuous inner wall delivers the inside water to the wheel face.

They are cool cutting and free from vibration or pounding. Mounted the same as a cylinder wheel, there is no resetting or adjustments required.

*Result:* Saves money by longer wheel life and faster cutting. Can you afford to do without them?

Manufactured and sold by us for use on Blanchard Grinders.

**THE BLANCHARD MACHINE CO.**
**64 STATE ST.**
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the purchase of new machines in order to obtain the improvements.

The most important improvement has been made in the design and construction of the rubber cushion **A**, Fig. 2, which is interposed between the front end of the hickory helve **B** and the reciprocating tool called the ram **C**. The

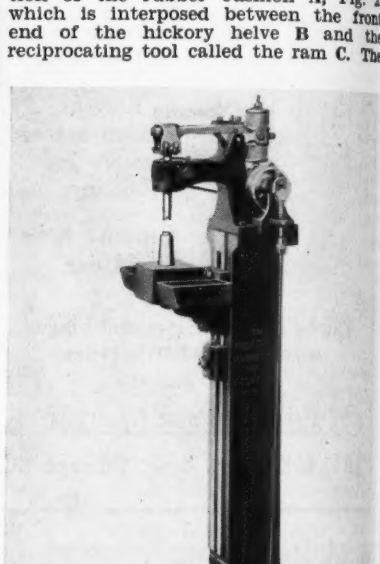

**Fig. 1—"High Speed" Riveting Hammer**

primary object of the present design is to rigidly secure the rubber cushion to the under side of the helve so that the helve and cushion will move as a unit. Thus the friction and impact incident to the striking of the reciprocating ram are confined to the lower face of the rubber cushion, reducing friction to the minimum and prolonging the life of the cushion.

Another object is to provide a cushion assembly adapted to eliminate the necessity of holding close tolerances in the length of the resilient strap which holds the ram in assembly with the helve and cushion, obviating the necessity for critical adjustments.

A further object of the improvement is to provide a cushion assembly which

will permit the use of a cushion consisting of a solid block of resilient material to be employed instead of tubular cushion, thereby providing greater volume of resilient material in the space occupied by the cushion. The arrangement also has the advantage of providing a cushion assembly in which the cushion is rigidly secured to the helve independent of the means for connecting the ram with the helve, thereby eliminating any binding and enabling it to rotate more freely. This in turn lessens the burden on the teeth of the worm and gear which rotate the ram, thus reducing power consumption.

Another important development is illustrated in Fig. 2, and consists of a center rubber retainer **M**, made in or part and dowelled by pin **P**, extending thrugh wrist pin **S**. This design eliminates the floating of the wristpin in the center rubber retainer, holds these two parts in a constant relative position, and confines the floating of the wrist pin to the bearings of vibrator **T**, thus eliminating wear on the connecting rod caused by oscillation of the wristpin in the center retainer. This improvement reduces the number of working parts and stabilizes the reciprocating action and blow of the hammer.

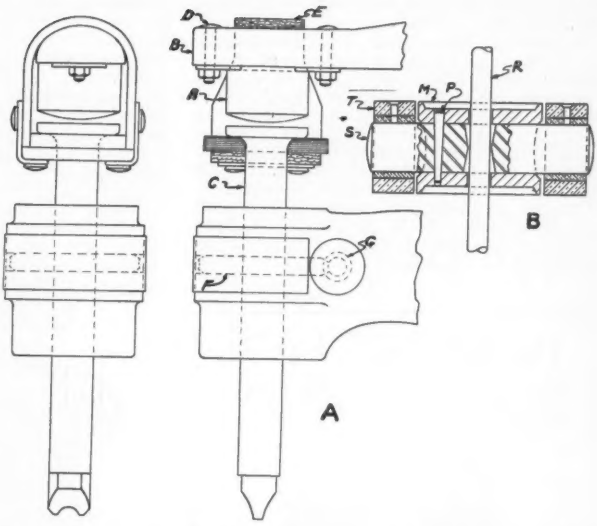


**Fig. 2—(A) Drawing illustrating improvement in cushion and helve assembly. (B) A center rubber retainer eliminates floating of wristpin eliminates wear on connecting rod and stabilized the action.**

## Sundstrand "Electromil"

Automatic electric table control is the feature of the Sundstrand "Electromil", which has been brought out by the Sundstrand Machine Tool Co., Rockford, Ill. The design of the machine in general is practically identical with the "Rigidmil", the machine being readily adaptable to a wide variety of jobs for which very simple fixtures can be used.

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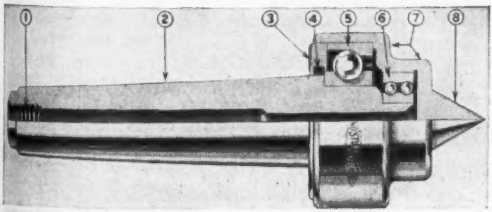

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vantages of the Electromil are its nimbleness of table-movement and facility of operation. These are secured largely through the electrical system of table control from which the machine derives its name. This function of the Electromil is divided between four horizontal plungers that control electrical circuits which energize solenoids to engage the feed or rapid traverse mechanisms or to reverse the table-drive motor, as required. Durable, light-weight electrical contacts are employed. It is practically instantaneous in operation, yet is said to be smooth and shockless.

Dogs of different heights, sliding in a T-slot on the adjacent edge of the table, actuate the plungers, each dog contacting only with the plunger it is designed to operate. By this arrangement, changes in table movement can take place in rapid succession and less than a quarter-inch from the point at which any movement in progress was engaged. The utmost advantage can be taken of every opportunity to rapid-traverse the table, and the length of feed can be controlled within a few thousandths of an inch. The machine is entirely controlled by push buttons, reducing physical effort to the handling of the work, and it is said that the machine can be operated by a girl seated at one end of the table.

**Sundstrand Electromil**


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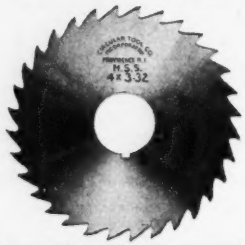

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Two motors were used, one for spindle rotation and the other for table feed and rapid traverse. All wires and electrical contacts are completely enclosed, fully protected and accessible. Twenty-five feeds, ranging from 1 in. to 80 in. a minute, are obtained through the use of eight pick-off gears. Rapid traverse speed is 400 in. per minute. Multiple disc clutches submerged in oil engage the feed or rapid traverse instantly without shock, and are disengaged as rapidly.

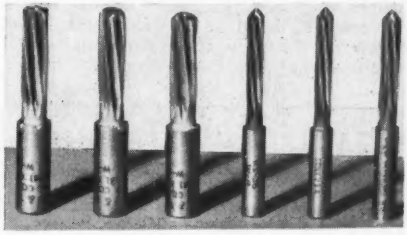
Spindle and all fast-running shafts are mounted in anti-friction bearings. The spindle head, which also carries the overarm, has micrometer vertical adjustment. Micrometer traverse adjustment is provided for the column with quick-acting clamps for both adjustments.

Four pick-off drive pulleys and two sets of belts are included as standard equipment, providing eight different spindle speeds ranging from 187 r.p.m. to 1125 r.p.m. Other spindle speeds are available by using special drive pulleys. Coolant is pumped direct to the cutters at a rate of 4 gal. per min.

The working surface of the table is 9½ x 23 in. Vertical adjustment of spindle head, 5½ in. Horizontal adjustment of spindle head, 3⅜ in. Spindle bearings, Timken. Floor space required, 40 x 49 in. Total height over column, 55 in. Net weight with motors, coolant, and lubricating oil, 2700 pounds.

## P & W Stub Screw Machine Reamers

Pratt & Whitney Company, Hartford, Connecticut, has placed on the market a line of stub screw machine reamers



P & W Stub Screw Machine Reamers

designed primarily for automatic screw machine work and for reaming jobs requiring short tools. These stub reamers provide the decimal sizes necessary in

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accurate production work where close fitting is needed. The decimal sizes are obtained by carrying the reamers in stock as standard blanks which are fluted, hardened and shank ground. These blanks are finished to the required size to order, making possible quick delivery of true decimal size tools.

The new stub reamers are made of high speed steel, heat treated for toughness and durability. The design produces very free cutting. These tools are successful in drill presses and hand screw machines, and are particularly well adapted for use in floating holders.

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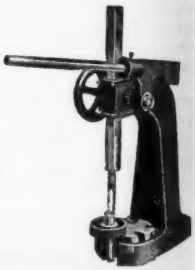
The reamers are carried in stock in 15 sizes of blanks ranging from series No. 1 which goes up to and includes .081 in., up to series No. 15, which covers the range from 0.4701 in. to 0.500 in. inclusive. The reamers in series No. 1 have four flutes and all other six flutes. All flutes are 7 deg. left hand spiral. The overall length of reamers in series No. 1 to 9 inclusive is 2¼ in. with an effective cutting length of 1 in. Series No. 10 to 15 inclusive have an overall length of 2½ in. with an effective cutting length of 1¼ in. Reamers in series No. 1 to 7 inclusive have 9 deg. external centers while the larger sizes are ground off flat.

## Threadwell Hand-Operated Keyway Cutter

To make possible the quick and economical cutting of key-ways in gears, collars, bushings, pulleys, and other similar parts, the Threadwell Tool Co, Greenfield, Mass., has developed a method of keyway cutting that is simple, fast, and accurate, and can be used with any available type of press.



**Showing method of using the Threadwell Hand-Operated Keyway Cutter.**

The equipment consists of a set of cutters in standard sizes, similar in design to broaching tools, and special bushings which serve to guide the cutters in operation. To use, a bushing is selected to fit the bore in which the keyway is to be cut, then a broach of the required size is inserted in the slot in the bushing and forced through the bore by the use of a press. The illustration shows the set-up for cutting a keyway in a gear, using an ordinary arbor press. Two or more cuts are made, the first being taken with the cutter alone and subsequent cuts being taken with shims behind the cutter to obtain the required depth.

The tool may be used efficiently with a light arbor press. For the cutting of special shapes such as dove-tail or half-round, special broaches can be furnished at slight additional cost. The standard line of cutters includes sizes from ⅛ in. in width to ½ in. Special bushings can

also be furnished, such as, for instance, cutting straight keyways in taper bores or cutting taper keyways in straight holes.

## Sentry Diamond Block Method of Hardening High Speed Steel

A neutral atmosphere in which high speed steel tools may be hardened without danger of scale, decarburization, or carburization is said to be possible thru the use of Sentry Diamond Blocks, made

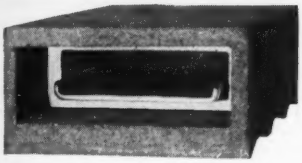


Fig. 1—Sentry Diamond Block, Assembled.

by The Sentry Company, Taunton, Mass. Sentry Diamond Blocks are made of a carbonacious compound which, when heated in a furnace at about 2350 deg. F., generates a gas which produces an atmosphere between carburization and decarburization. The process is clean and, since the compound is not chemically active, the materials used in furnace construction are not attacked.

The time element is not critical and tools can be given an ample soaking pe-

Fig. 2—Tray with baffle to exclude gases.

riod to assure maximum hardness. Although conditions usually dictate a period of heating time which is found to be most satisfactory for hardening high speed steel, it is said that tools left for twice the normal length of time showed micro structures similar to that obtained by the normal treatment. Thus spoilage due to over-heating is practically eliminated.

Special high speed steel containing cobalt or molybdenum which will be decarburized in any other atmosphere may easily be hardened by the Sentry Block

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method, thus making available the special advantages offered by the use of these alloys.

Trays are used to support the tools inside of the blocks, the trays being made of refractories or metal and shaped to meet requirements. A tray with a baffle to exclude diluting gases is shown in Fig. 2. The tray, muffle and block are shown assembled in Fig. 1.

## "Velvo-Grip" Tools

Designed for the special benefit of the craftsman who takes pride in his work, or for use in industries where scratches or mars on the work are not permissible, the tools shown in illustration are being offered by Wolverine Industries, Harbert, Michigan. The two tools shown are the "Velvo-Grip" wrench, and the "Velvo-Grip" Vise, the outstanding feature of each being the manner in which wood jaws are used to hold the work. The jaws are designed to grip the full surface of the work so that, while sufficient pressure is applied to hold the work securely, the work will neither be scratched, marred, crushed, nor injured in any way.

"Velvo-Grip" Vise and Wrench

The jaws are interchangeable between the two tools. They are made of hardwood, treated to prevent checking or shrinking, and are so fitted to the tools in which they are used that they can be removed by tapping lightly. The vise consists of a malleable iron frame, made in two parts, a screw yoke, and a set of


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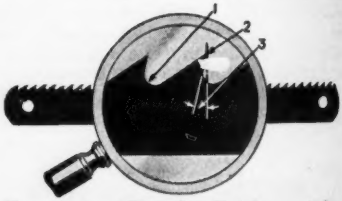


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cushion jaws for standard size materials. The base is 5 x 10 in., with ½-in. bolt holes for bolting in position. The screw yoke is pivoted in one end of the base and to the other end is hinged the upper half of the frame.

The wrench also has a two part frame, but depends on a cam action for its grip. The handle is so placed with relation to the two halves of the frame that the greater the pressure applied on the handle, the tighter will be the grip on the material. Both tools open at a wide angle for easy clearance of materials. Aluminum or bright finish is optional. Jaws for clamping irregular shapes can easily be made, or can be furnished as required.

## Graham Emery Wheel Dresser Holders

To aid in the production of better ground work with a minimum of waste from the dressing of grind wheels, The Graham Mfg. Co., 73 Willard Ave., Providence, R. I., has placed on the market two styles of holders for emery wheel dressers. The holders, shown in the illustrations, are intended for general

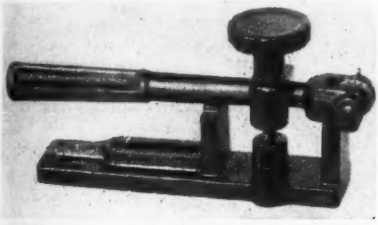

Fig. 1—Long-Base Type Graham Emery Wheel Dresser Holder

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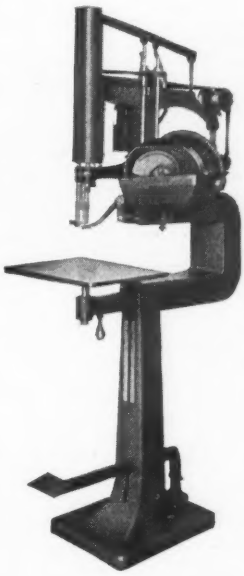

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LONDON OFFICE
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London, England

application to the many designs of grinding machines now in use, and are designed to hold the common types of wheel dressers such as the Huntington or diamond dressers.

The holder is made in two styles; the long-base type, shown in Fig. 1 and the square-base type, shown in Fig. 2. Both styles are made with bolt slots for attaching to the machine table or other available place. In both styles of the holder, the top of the vertical section, in which the dresser hand is held, is made V-shape so as to afford a firm grip on the handle. The vertical section also has flat shoulders to accommodate the Huntington style of dresser so that it can be gripped close to the head. A swing clamp and screw-type hand knob is used to clamp the dresser handle in place.

The holder is designed to locate the center of the ordinary type of dresser

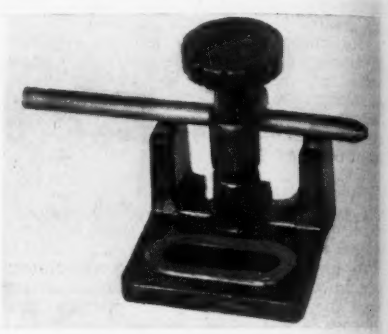

**Fig. 2—Square-Type Holder**

slightly over 3 in. above the surface of the table. The square type holder has a base 4¼ in. square, with cross and lug slots suitable for ⅝ in. bolts. The long type holder is 2 in. wide by 9 in. long. The net weight of the holder, with dresser, is 6 pounds.

## Electrode For Welding Cast Iron Announced by Lincoln

An electrode for welding cast iron by the shielded arc process is announced by The Lincoln Electric Company, Cleveland, Ohio. The electrode, known as "Ferroweld" not only simplifies welding procedure on cast iron but produces a weld

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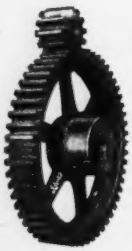

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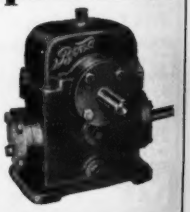

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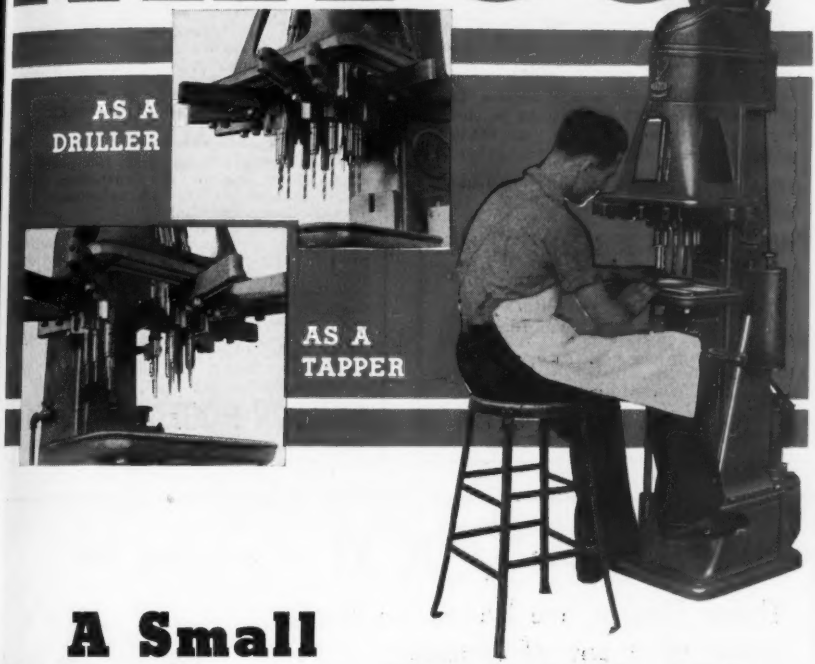


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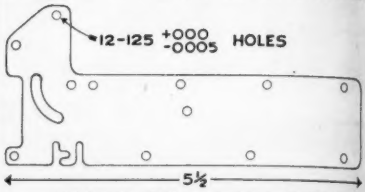


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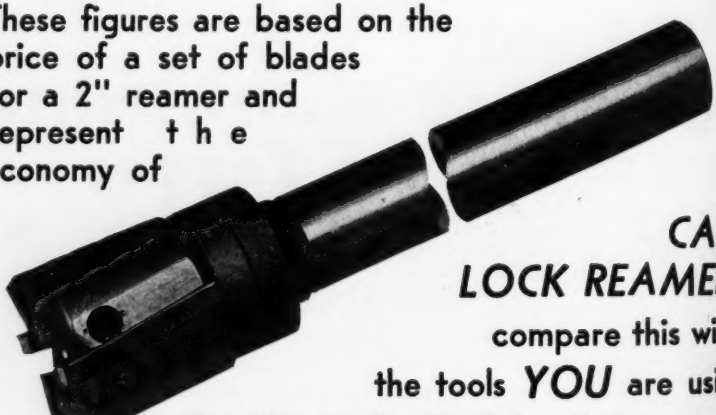

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"Ferroweld" has a steel core surrounded by a heavy flux coating which protects the arc from gases injurious to the weld which are present in the atmosphere. One of the outstanding advantages claimed for "Ferroweld" is the remarkably low heat with which it can be used, thus reducing the possibility of cracking. The electrode is manufactured in only one size—⅛-in.—and is used with approximately 80 amperes of current.

Welding is done intermittently, not over a three-inch bead being laid down at one time. As each lead is welded it is

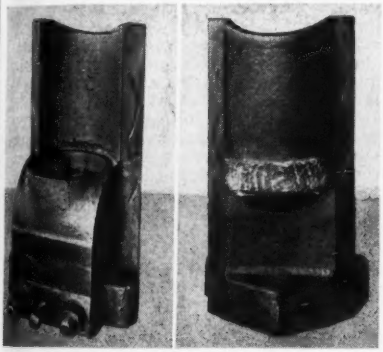

Fig. 1 (Left)—Front view of cast iron punch press ram which was broken and repaired with Ferroweld. Fig. 2 (Right)—The ram is 22 in. wide and 1½ in. thick at the break.

peened lightly, thoroughly cleaned and allowed to cool somewhat before the next bead is deposited. Due to the extremely low current with which it is used the hardening effect ordinarily present along the line of fusion is materially reduced. Thus the weld is more machinable than most cast iron welds.

The photographs show a weld made on a punch press ram with "Ferroweld". The ram is about 22 in. wide and approximately 1½-in. thick at the break. The press in which the ram is used is in constant use for punching holes as large as 7 in. in diameter in 10 gauge steel. The ram was broken in operation at the point indicated by the chalk mark on the photograph. In order to repair the ram the part was Vee'd out, with a Vee about 2 in. wide at the back, leaving approximately ⅛ in. of metal at the bottom of the Vee. The part was then tack welded at the inner ends of the


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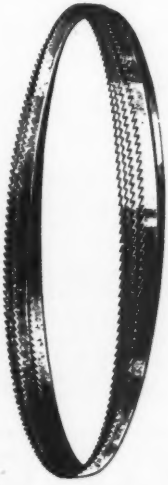

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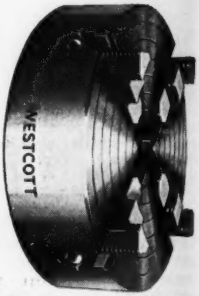
chalk marks. Short beads were laid intermittently along the line of the break, first on one side of the ram and then on the other. The outside flanges of the ram which fit in the guides were ground down after welding. There were no signs of cracking or pulling away in the weld. No checks were present.

This ram has been in use for several weeks after welding and is operating as well as when new.

## Westcott Light Duty I.X.L. Independent Lathe Chuck

The Westcott Chuck Company, 318 E. Walnut St., Oneida, N. Y., is now producing the Light Duty I.X.L. Independent Lathe Chuck shown in the illustration. The outstanding features of the chuck are said to be (1) strength, (2) lightness, and (3) uniform overhand consistent with good engineering practice. It is well-known that a thick, heavy chuck mounted on a small diameter spindle produces injurious chatter, and to eliminate this difficulty the Westcott Company's engineers have—by careful design and much experiment with materials—produced a chuck that can successfully be used on so-called light duty lathes of all kinds.



Wescott Light Duty I.X.L. Independent Lathe Chuck

The body of the chuck is of high strength close-grain nickel iron, in one piece. The jaws, which are of a special grade of case-hardening steel, are hand-fitted to the chuck and have raised and accurately-ground steps. When mounted on a true spindle with a true adapter, these steps show a longitudinal run-out of less than 0.001 in. The long end of each jaw is serrated so that when the jaws are reversed they will grip bars and small round stock efficiently.

The jaw screws are threaded the full length except where they are necked for the bearings. They have mortised heads to take a square-end T-handle wrench. The steel used in these screws is of a special quality which insures the mortised heads not breaking out, even under

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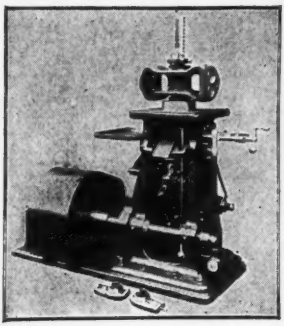

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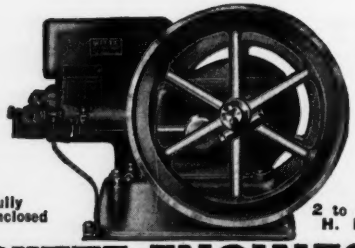


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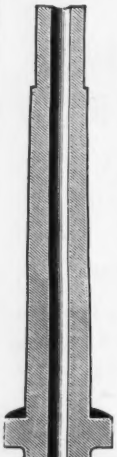

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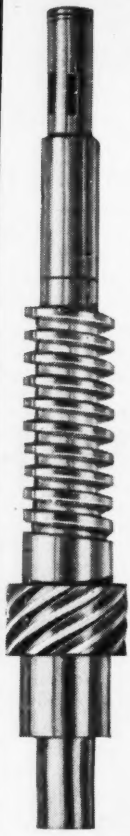

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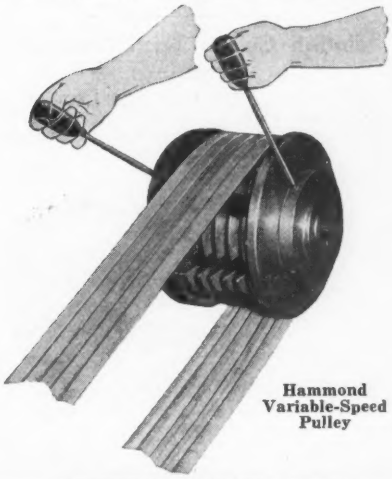
extra hard or grueling service.

Nickel steel is used in the thrust bearings, and the bearings are heat treated and are fitted tightly into the chuck body. Adapter bolts and T-handle wrench for operating the chuck are included. Sizes now available include 3-in., 4-in., 5-in. and 6-in., all with four reversible jaws.

## Hammond Variable-Speed Pulley

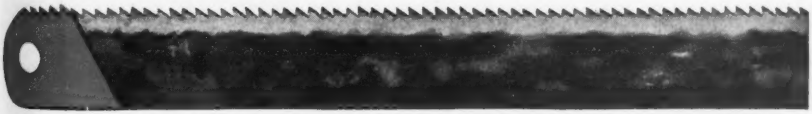
Hammond Machinery Builders, Kalamazoo, Michigan, announce the new Hammond Variable Speed Pulley, designed to provide a means of maintaining periphery speeds on grinding, polishing and buffing wheels. The pulley is compact and incorporates the Multi-V-belt. Changes in speed are effected by expanding or contracting the diameter of the pulley. The segments engage at their inner ends with a scroll thread. Any speed within the range of the pulley may be had, and the range of speed is 50 per cent greater than the low speed. Changing from one speed to another is stated to be very simple, requiring about one minute of time. The pulley is nine inches in diameter, fully expanded. The width varies with the number of V-belt grooves used, which are determined by the driving horse power.

This pulley is adaptable to the Hammond line of polishing and buffing lathes and has also been found very worth



Hammond Variable-Speed Pulley

**Hammond Variable-Speed Pulley**

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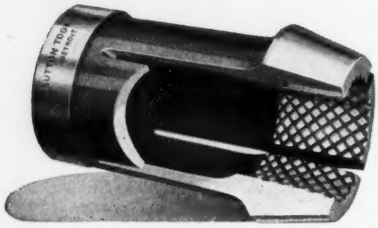
while on other applications; in fact, any machine where a quick change of speed is desired. The weight of the pulley is 58 pounds.

## Sutton Collets With Diamond Serrations

Collets for automatic and hand screw machines with diamond serrations instead of the conventional rectangular



Sutton "Sur-Grip" Collets with Diamond Serrations

serrations have been developed by Sutton Tool Company, 2842 W. Grand Blvd., Detroit, Mich. These collets are marketed under the trade-name of Sutton "Sur-Grip" Collets.

The advantage claimed for collets with diamond serrations is based on the theory that the diamond serration attacks horizontal and rotating thrusts at an angle in contrast to the parallel resistance offered by rectangular serrations. In operation, the superior gripping power of the diamond serration permits a reduction of the tension of the chucking mechanism and reduces the chance of slippage, thereby prolonging the life of both the collet and the chucking equipment and lowering the percentage of spoiled work.

The Sutton Company has developed special equipment for generating diamond serrations that insures serrations of uniform size and shape. All Sutton round and hex collets can now be furnished with diamond serrations.

## Ex-Cell-O Drill Speeder

Ex-Cell-O Aircraft & Tool Corporation, 1220 Oakman Blvd., Detroit, Michigan, announces the development of a special drill-speeder unit for horizontal boring and milling machines, radial drills and similar machines. With this unit a

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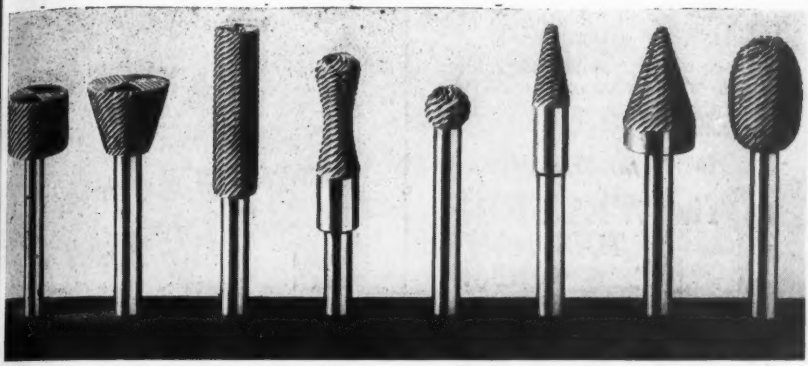

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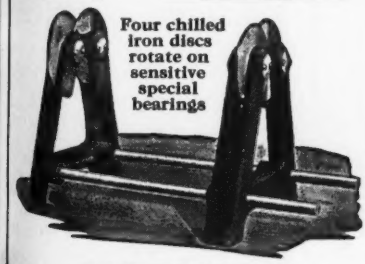

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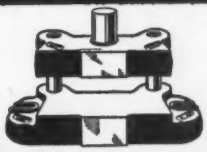

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higher range of speeds can be obtained, which is an advantage in drilling the smaller sizes of holes.

Figure 1 shows the drill-speeder unit only, and Fig. 2 shows the application of

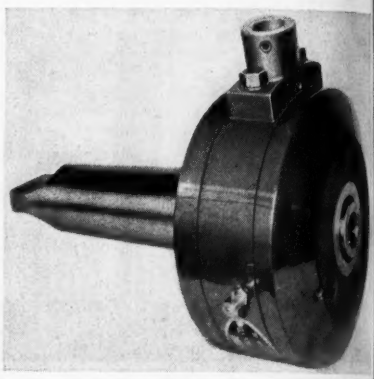


**Fig. 1—Ex-Cell-O Drill Speeder**

the head to a horizontal boring mill. The driver of the head is made with a No. 5 Morse Taper, and the drill spindle in the nose of the drill speeder is fitted

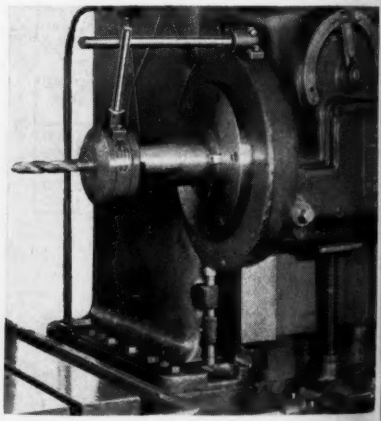
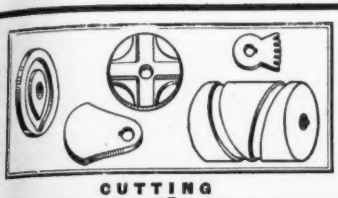


**Fig. 2—Drill Speeder installed on a horizontal boring machine.**

with a No. 3 Morse Taper to accommodate drills up to 1$\frac{1}{16}$ in. in diameter.

The ratio of the drill speeder is four to one over the spindle speed of the machine



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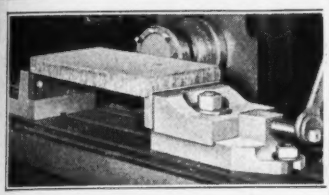

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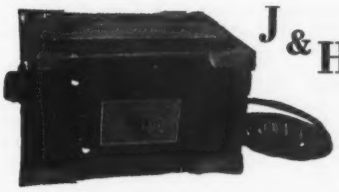

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on which the unit is used. The maximum speed at which the machine spindle should be operated is 700 r.p.m., giving a maximum drill speed of 2800 r.p.m.

The unit is provided with a boss on the outside diameter of the head in which a bar is inserted to engage with a suitable bar mounted on any stationary portion of the machine proper, as illustrated in Fig. 2. The boss supporting the bar on the machine is furnished with the head. Both bars are to be provided by the customer to fit the machine to be used.

A knockout bar for drifting the drills from the high-speed spindle projects through the driving tang so that they can be removed by means of a drift pin inserted in the drift slot of the machine spindle without removing the unit from the machine. The units are all furnished with No. 5 Morse Taper drive, which enables the customer to provide suitable sleeves or adapters to fit the particular make and style of machine on which the unit is to be used.

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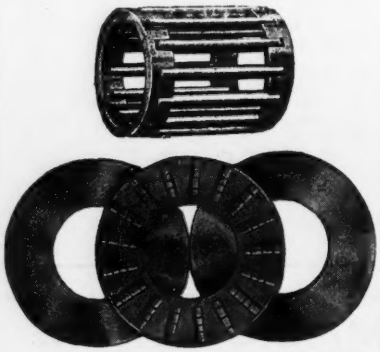
"Red Devil" No. 30 Three-Burner Gas Bench Furnace



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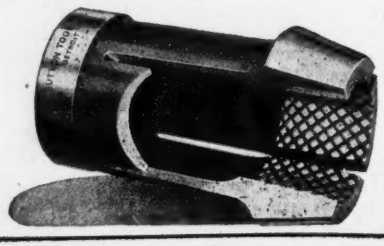

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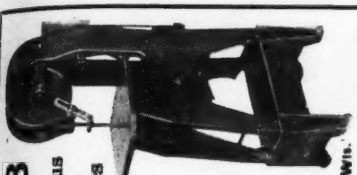

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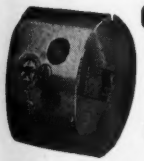

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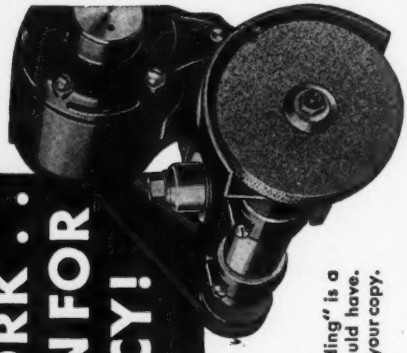

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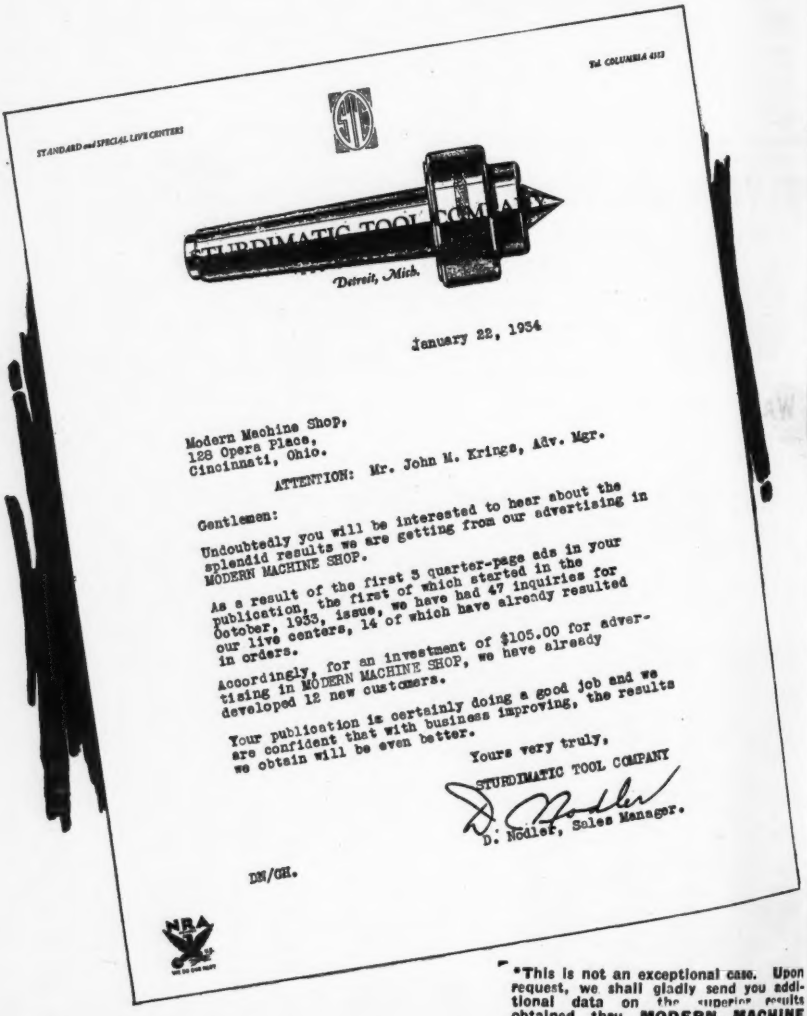

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128 Opera Place,
Cincinnati, Ohio.

ATTENTION: Mr. John M. Krings, Adv. Mgr.

Gentlemen:

Undoubtedly you will be interested to hear about the splendid results we are getting from our advertising in MODERN MACHINE SHOP.

As a result of the first 3 quarter-page ads in your publication, the first of which started in the October, 1933, issue, we have had 47 inquiries for our live centers, 14 of which have already resulted in orders.

Accordingly, for an investment of $105.00 for advertising in MODERN MACHINE SHOP, we have already developed 12 new customers.

Your publication is certainly doing a good job and we are confident that with business improving, the results we obtain will be even better.

Yours very truly,

STURDIMATIC TOOL COMPANY

D. Nodler, Sales Manager.

DN/CH.

NRA WE DO OUR PART

*This is not an exceptional case. Upon request, we shall gladly send you additional data on the superior results obtained thru **MODERN MACHINE SHOP** by other manufacturers.

# ...nd already 14 orders"

## from 3 quarter page ads in MODERN MACHINE SHOP*

AGAIN the outstanding result-producing ability of MODERN MACHINE SHOP is clearly demonstrated. Note what the Sturdimatic Tool Co., Detroit, has to say.

Results count today and more and more industrial advertisers are realizing the importance of complete market coverage. 44 new advertisers have already selected and appeared in MODERN MACHINE SHOP in 1934—26 in this issue.

With its more than 25,000 hand picked circulation, covering the mechanical executives in more than 20,000 metalworking plants, MODERN MACHINE SHOP offers you a definite contact with BY FAR the largest interested audience of prospective buyers of your equipment.

With business improving, we suggest you start your messages with the March issue. Send copy now. Forms close February 24th.

## MODERN MACHINE SHOP

CINCINNATI, OHIO

*"The most widely read metalworking magazine in the world."*

and will serve as an efficient, economical auxiliary to larger heat treating furnaces.

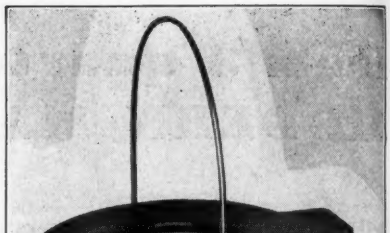
The No. 30 furnace has three powerful Bunsen burners, each with shut-off valve. The furnace is 16½ in. long, 8 in. high, and 7½ in. wide, with a firebox that is 6½ x 6½ x 5 in. The firebox opening is 6½ x 3½ in. The firebox is lined throughout with durable fire clay, and a pilot light is provided. The gas ignites automatically the instant the burner valves are opened, providing a flame temperature of 2250 deg. F.

The furnace is admirably adapted for heat treating small parts or tools, or for melting small quantities of lead, tin, babbitt, and so on. The speed of operation and fuel economy will make this furnace indispensable to the tool room, maintenance shop, or small manufacturing plant.

## Newton Junior Melting Pot

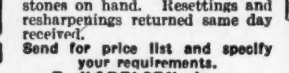
Newton Junior Corporation, 151 Court St., New Haven, Conn., announces a portable electric solder and melting pot which is built to meet the demand for an efficient pot at an economical first cost. The pot is of a size and type that is ideal for tinning, dipping small work, hardening small tools, and so on, and will melt and keep in a molten condition any metals or materials with a melting point as high as those of tin and solder.

Metal can be melted continuously as it is used, and a constant temperature can be maintained for long periods. The pot is designed to maintain a very close, balanced operating temperature. When normal heating temperature is reached, the pot temperature remains practically con-



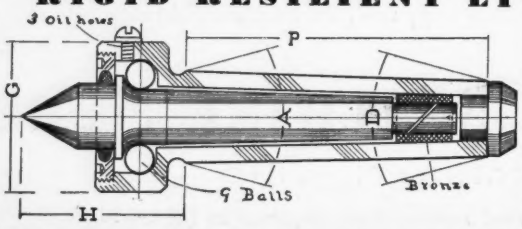
Newton Junior Melting Pot

**DIAMOND TOOLS**
**FOR ECONOMY**



All types for dressing grinding wheels. Shaped Diamond Tools, etc. Large stock unset stones on hand. Resettings and resharpenings returned same day received.
**Send for price list and specify your requirements.**
**E. KARELSEN, Inc.**
Established 1852
**15 West 44th St., New York, N. Y.**

**RIGID RESILIENT LIVE CENTER**




Shortest Over-Hang, but long Spindle. Smallest Head, yet largest bearing balls. Heaviest Duty, yet lightest Runner. Springy neck, fewest parts and simplest. Spindle and Case S.A.E. 52100.
*Chicago R. R. Live Center increased Axle-Turning 50 per cent.*
RIGID TOOL HOLDER CO., 2020 WITHERELL ST., DETROIT, MICH.

stant through any period of operation. Heat is applied to over 80 per cent of the possible heating area of the pot, making possible the maximum heating speed. When filled to capacity the melting period of the pot is approximately 20 minutes. Being fully insulated, when operating at maximum capacity the pot draws about 275 watts of current.

It is impossible for molten metal to enter the heating chamber, and the terminals are guarded from overflow or dripping metal. The pot is said to be manufactured of the highest grade materials, and when used for the purpose intended will give satisfactory service in both continuous and intermittent operation.

## "Peach-Kleen"

"Peach-Kleen" is the name of an unusual hand cleaning compound, in dry powder form, which contains no lye, pumice, sand or chemicals that are detrimental to the skin. The manufacturers state that the compound is composed chiefly of materials that have never before been used in hand cleaning compounds. The following features are claimed for this hand cleaner: it will soften dirt; it absorbs the dirt, making it impossible for it to return to the skin structure; it is active in any kind of water, fresh or salt; it has a germicidal effect on skin abrasions; it is free from harmful elements. A sample can, containing enough for applications, can be had for 15 cents, stamps or coin.

"Peach-Kleen" is a product of R-S Products Corporation, Philadelphia, Penn.

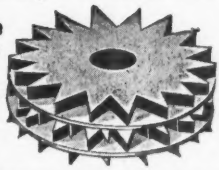
## Stonhard Floor Resurfacing Material

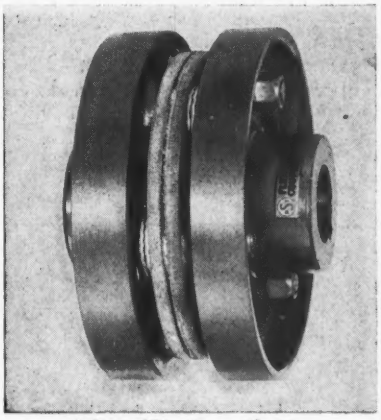
Stonhard Company, 401 North Broad St., Philadelphia, Pa., is now marketing a floor repair material which offers many advantages over old-fashioned methods of repairing irregularly worn, broken factory floors, trucking aisles and platforms. This material is mixed with sand and cement and the mortar is laid cold, one-half inch thick. The first cost is somewhat lower than other types of plastic flooring.

Where concrete floors are to be patched or resurfaced, chipping, roughening or acid-washing are not necessary. Ordinary cleaning is sufficient.

Any handy man can use this material. It will bond to concrete, wood, brick, wood block, asphalt or composition floors

CENTERLESS GRINDING
Accuracy — Prompt Service
COMMERCIAL CENTERLESS GRINDING CO.
6538 CARNEGIE AVE. CLEVELAND

Grinding Wheel Dressers
We Make all types of Dressers and Cutters

Write for Catalog "M"
DESMOND-STEPHAN MFG. CO.
URBANA, OHIO


FlexoiD Couplings
PST
*Write for circular.*
Smith Power Transmission Co.
1213 W. Third St., Cleveland, O.

and is ready for traffic thirty-six hours after being laid.

The advantage of a material that can be applied cold is readily apparent. Any possible fire hazard is avoided as well as the possibility of burns from handling of the materials.

This type of flooring will not dust, and being resilient, is not noisy like harder substances.

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**ENGINEERING DATA, ALLEN HOLLOW SET SCREWS AND SOCKET HEAD CAP SCREWS:** Showing Recommended Sizes of Set Screws and Recommended Tightening Force of Cap Screws. This bulletin, issued by The Allen Manufacturing Co., Hartford, Conn., contains eight 8½ x 11-in. pages of data and information for the designing engineer.

In addition to a discussion of features of design, stresses, and so on, the bulletin contains seven tables and a chart as follows: Table Showing Proper Size Relationship Between Cup Point Set Screw and Shaft Diameter; Recommended Inch-Pound Tightening Force Holding Power of Cup Point Set Screws on Various Shaft Diameters; Holding Power of Cup Point Set Screws on Flat Surfaces; Recommended Tightening Force; Table of Cap Screw Dimensions; Area at Minor Diameter of Thread, and Chart Showing Relation of Stresses to Design.

A copy of this bulletin is available to any engineer who will address his request on his firm letterhead.

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**AN OUTLINE OF HISTORY FOR ANTI-FRICTION BEARINGS:** The history of anti-friction bearings from the dawn of civilization down to the present day is outlined in an interesting manner in a booklet that is now being published under the above title by The Fafnir Bearing Company, New Britain, Conn. Copies are free to mechanical executives, engineers, and draftsmen.

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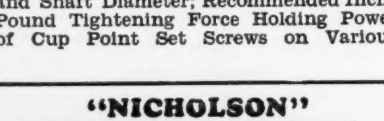
**PACKER ROTARY AUTOMATIC POLISHING AND BUFFING MACHINES:** A folder describing and illustrating the latest types of Packer Automatic Polishing and Buffing Machines has been issued by The Packer Machine Co., Meriden, Conn. Copy free upon request.


**"NICHOLSON" EXPANDING MANDRELS**



THEY act like a four jawed chuck, expanding in the bores of collars, bushings, gears, pulleys, etc., and holding them securely while being machined in a lathe, miller, shaper or grinder. For bores from ½" to 7".

W. H. NICHOLSON & COMPANY
136 Oregon Street Wilkes-Barre, Pa.

MECHANICAL DEVICES
of every description — completely assembled or
STAMPINGS
Quantity Production or Sample Runs

GERDING BROS.
Mechanical Productionists
5 E. Third St. Cincinnati, Ohio

*16"x6' Quick Change Gear Lathe with Underneath Motor Drive.....$777*

CONVENIENT TERMS provide for easy payments on any lathe.

**South Bend** Back-Geared Screw Cutting **Lathes**

**96 Sizes and Types 9" to 18" Swing**

The 16" x 6' Lathe shown at left has the power and rigidity for heavy jobs and precision for the finest tool work. Also available in tool room types and countershaft drive types.

**Prices of Popular Size Lathes**

| Size of Lathe | Weight Crated | Countershaft Drive | Motor Drive |
|---|---|---|---|
| 9" x 3' | 595 lbs. | $275 | $402 |
| 11" x 4' | 965 lbs. | 340 | 498 |
| 13" x 5' | 1510 lbs. | 402 | 602 |
| 15" x 6' | 2070 lbs. | 485 | 720 |
| 16" x 8' | 2460 lbs. | 580 | 817 |
| 18" x 10' | 3490 lbs. | 759 | 1051 |

(Also Bench Lathes as low as $108)

Send for new 1934 Catalog No. 94 describing complete line of South Bend Lathes and attachments, free, postpaid. Specify size of lathe you are interested in.

NRA

**SOUTH BEND LATHE WORKS** 310 E. Madison St., South Bend, Ind.

## Lessons in Arc-Welding

The Lincoln Electric Company, Cleveland, Ohio, has compiled a series of 28 lessons in arc welding, consisting of some sixty mimeographed pages and well illustrated by sketches. These lessons are based on the course in arc welding given at the plant of the above firm by Mr. Arthus Madson, and contain in substance the same information that has been used by Mr. Madson in teaching several thousands of men to become practical arc welding operators. Theory has been avoided and the subject has been approached from the practical standpoint.

It is the object of the lessons to present, in a concise manner, the fundamental facts of welding and the use of welding equipment. Every phase of the subject is covered, from the striking of the arc to demonstrations of cutting, including instructions on butt welding, lap welding, tee welding, vertical, horizontal and overhead welding, and the making of lap and, butt and fillet welds in each of these instances.

The price of this set of lessons is 50 cents, domestic postage prepaid; foreign postage 25 cents extra. Address The Lincoln Electric Company, P. O. Box 683, Cleveland, Ohio.

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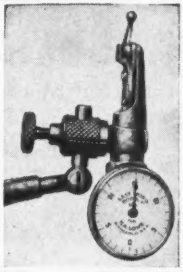
**BOND STANDARD STOCK GEARS:** Designing engineers, chief engineers, and mechanical executives who are directly concerned with the use of gears or gearing, either in machine design or construction or for maintenance purposes will find the Bond Catalog No. 56, issued by the Charles Bond Company, 617 Arch St., Philadelphia, Pa., of great value.

Of convenient pocket size, the book contains 160 pages of information, a part of which, of course, consists of tables of the sizes and prices of gears that can be supplied by the Charles Bond Company — and the range is wide indeed. Several pages are devoted to sizes, descriptions, and prices of gear reductions units for all purposes, and a number of this company's other products such as flat and grooved, pulleys, shaft hangers, pillow blocks, hardened steel washers, universal joints, insulated couplings, roller bearings, and truck casters.

A large section of the book is devoted to tables of information on gears, and includes definitions of gear part terms, rules and formulas for gear sizes, tooth dimensions of stub teeth, table of horsepower of gears, table of S. A. E. specifications of carbon steels, and other useful tables. Copies free upon request.

**LAST WORD INDICATORS**

Accuracy, adaptability and long life make LAST WORD Indicators outstanding in the gaging field.

Write for circular giving specifications and prices.

**H. A. LOWE CO.**
1875 East 66th St.
Cleveland, Ohio

**The Mummert-Dixon Spot Facer**

...enables you to machine accurate and smooth surfaces on small bosses, etc., in less time than by any other method. Better investigate! Send for a bulletin.

**MUMMERT-DIXON CO.** 120 Philadelphia St. HANOVER, PA.

WRITE FOR CATALOGS

**FEDERAL "Built Like the Finest of Watches"**

Chronometer-like accuracy is only obtained by the finest construction. The precision of Federal Model 16 (for exceptionally close work) on which .0001" reads like .001" on ordinary gages, is obtained by the use of jeweled bearings, stainless steel racks, gears and pinions, unit movements independent of the case and other exclusive Federal features.

*There's a Size and Model to insure greater precision at lower cost for every class of work.*

**FEDERAL PRODUCTS CORPORATION**
1144 EDDY STREET, PROVIDENCE, R. I.

*Branches* DETROIT—CHICAGO—CLEVELAND—MUNCIE—NEW YORK

**DIAMOND MOTOR DRIVES.** The person who is confronted with a "drive" problem will find this book of the utmost value. Issued by the Diamond Chain & Mfg. Co., 459 Kentucky Ave., Indianapolis, Ind., the book contains 64 pages of information regarding the selection and application of chain drives. For motors with no-load speeds of from 600 to 1800 r. p. m. tables of complete information are given, making it possible for anyone to select the correct chain drive without the necessity of making any mathematical calculations.

In addition to the tables referred to, data is included showing how the calculations are made for any kind of drive, the advantages of roller chain drives are outlined, and a number of illustrations show the application of roller chain drives to a large variety of equipment. A considerable amount of information is also included concerning the installation, care, and lubrication of chain drives. Special drives are also discussed. Copies gratis to engineers and mechanical executives.

MAGNOLIA

Bronze Bar Stock
Cored and Solid

Semi-Finished Inside. Skinned Outside. Cleaned up ends. S.A.E.—64 Specifications. Write for folder.

*Buy thru Dealers*

MAGNOLIA METAL COMPANY
Elizabeth, N. J.


## Magnolia Semi-Finished Phosphor Bronze Bushing

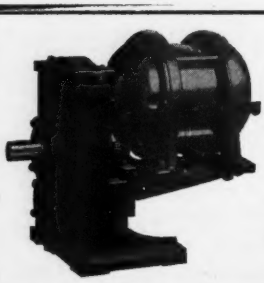
A new form of bearing bronze of particular interest to maintenance engineers is the semi-finished (outside and inside) Magnolia Phosphor Bronze Bushing, made by the Magnolia Metal Company, Elizabeth, N. J.

Magnolia Bronze Bushings have the important feature of having the inside surfaces semi-finished as well as the outside. This assures the user that no loss of time or material will ever be incurred by the user from having hidden blow holes, sand spots or cracks show up on the inside of the bushing when it is being machined to exact shape and dimensions in the user's own shop.

In the manufacture of Magnolia Phosphor Bronze, care is taken in machining so that the dimensions are always full with Magnolia Phosphor Bronze Bushings only ⅛ in. is needed for "cleaning up" because of the semi-finishing done before the bushing reaches the user.

Magnolia Bronze is furnished in standard 12 in. lengths, from ½ in. solid up to 5 in. outside diameter; cored up to 2½ in. inside diameter. The manufacturer guarantees the highest possible service from these bushings, which conform to S.A.E. specifications Number 64. Magnolia Bronze Bushings are free from zinc and consequently offer the greatest possible resistance to acid fumes and liquids.

"Alnor"
MODEL 222
PYROMETER
For the Hardening Furnace
Price complete without protection tube. $40
Write for information
ILLINOIS TESTING LABORATORIES, Inc.
146 W. Austin Ave. CHICAGO, ILL.



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SPEED REDUCERS
FOR
Motors From ⅛ to 15 H. P.
*NEW CATALOGUES ARE READY*
*SEND FOR YOUR COPY*
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